INTERNET DOCUMENT INFORMATION FORM

A . Report Title: Acquisition of the Naval Fires Control System

B. DATE Report Downloaded From the Internet: 03/14/02

C. Report's Point of Contact: (Name, Organization, Address, Office Symbol, & Ph #): **OAIG-AUD (ATTN: AFTS Audit Suggestions)**
Inspector General, Department of Defense
400 Army Navy Drive (Room 801)
Arlington, VA 22202-2884

D. Currently Applicable Classification Level: Unclassified

E. Distribution Statement A: Approved for Public Release

F. The foregoing information was compiled and provided by:
DTIC-OCA, Initials: __VM__ **Preparation Date 03/14/02**

The foregoing information should exactly correspond to the Title, Report Number, and the Date on the accompanying report document. If there are mismatches, or other questions, contact the above OCA Representative for resolution.

Audit Report

ACQUISITION OF THE NAVAL FIRES CONTROL SYSTEM

Report No. D-2002-036 January 8, 2002

Office of the Inspector General
Department of Defense

Additional Copies

To obtain additional copies of this audit report, visit the Inspector General, DoD, Home Page at www.dodig.osd.mil/audit/reports or contact the Secondary Reports Distribution Unit of the Audit Followup and Technical Support Directorate at (703) 604-8937 (DSN 664-8937) or fax (703) 604-8932.

Suggestions for Future Audits

To suggest ideas for or to request future audits, contact the Audit Followup and Technical Support Directorate at (703) 604-8940 (DSN 664-8940) or fax (703) 604-8932. Ideas and requests can also be mailed to:

OAIG-AUD (ATTN: AFTS Audit Suggestions)
Inspector General, Department of Defense
400 Army Navy Drive (Room 801)
Arlington, VA 22202-4704

Defense Hotline

To report fraud, waste, or abuse, contact the Defense Hotline by calling (800) 424-9098; by sending an electronic message to Hotline@dodig.osd.mil; or by writing to the Defense Hotline, The Pentagon, Washington, DC 20301-1900. The identity of each writer and caller is fully protected.

Acronyms

ADOCS	Automated Deep Operations Coordination System
AFATDS	Advanced Field Artillery Tactical Data System (Army)
AoA	Analysis of Alternatives
C^4I	Command, Control, Communications, Computers, and Intelligence
CRD	Capstone Requirements Document
EVMS	Earned Value Management Systems
JITC	Joint Interoperability Test Command
LAWS	Land Attack Warfare System
NFCS	Naval Fires Control System
ORD	Operational Requirements Document
PEO(S)	Program Executive Office for Surface Strike
SACC	Supporting Arms Coordination Center
TEMP	Test and Evaluation Master Plan

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-4704

January 8, 2002

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS
ASSISTANT SECRETARY OF DEFENSE (COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE)
DIRECTOR, JOINT STAFF
NAVAL INSPECTOR GENERAL

SUBJECT: Audit Report on the Acquisition of the Naval Fires Control System (Report No. D-2002-036)

We are providing this report for review and to obtain comments and a statement of actions to be taken. This report discusses the readiness of the Naval Fires Control System to enter full-rate production. We considered comments from the offices of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence); the Assistant Secretary of the Navy (Research, Development, and Acquisition); and the Director, Joint Staff, on a draft of this report in preparing this final report.

DoD Directive 7650.3 requires that all recommendations be resolved promptly. The comments from the Office of the Assistant Secretary of the Navy (Research, Development, and Acquisition) on Recommendation A.1. were unresponsive. Further, the Navy comments did not meet the intent of Recommendations A.2., B.1., and B.2. Therefore, we are redirecting Recommendation A.1. to the Under Secretary of Defense for Acquisition, Technology, and Logistics and we revised Recommendations A.2., B.1., and B.2. to clarify our intention. We request that the Under Secretary and the Navy provide comments on the recommendations by February 8, 2002.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Mr. John E. Meling at (703) 604-9091 (DSN 664-9091) (jmeling@dodig.osd.mil) or Mr. Jack D. Snider at (703) 604-9087 (DSN 664-9087) (jsnider@dodig.osd.mil). See Appendix E for the report distribution. The audit team members are listed inside the back cover.

Thomas F. Gimble
Acting
Deputy Assistant Inspector General
for Auditing

Office of the Inspector General, DoD

Report No. D-2002-036 **January 8, 2002**
(Project No. D2001AE-0069)

Acquisition of the Naval Fires Control System

Executive Summary

Introduction. The Naval Fires Control System (NFCS), a Navy Acquisition Category III program, is an automated mission-planning system for Naval surface-fire support that will be interoperable with Army and Marine Corps fire support systems on future, digital battlefields. The NFCS will coordinate and execute fire support weapon engagements from *Arleigh Burke* class destroyers and *Ticonderoga* class cruisers, receive targeting data, generate a coordinated land tactical picture, and prepare fire plans. The Navy plans to procure and maintain the NFCS for an estimated cost of $111.6 million over a 15-year life cycle and will hold the full-rate production decision in FY 2003.

Objectives. The primary audit objective was to evaluate the overall management of the NFCS. Because the program was in the engineering and manufacturing development phase, we determined whether management was cost-effectively readying the program for the production phase of the acquisition process. We also evaluated the management control program as it related to the audit objective.

Results. Overall, the NFCS program warrants attention in the areas of development and acquisition, earned value management, operational requirements, and test and evaluation planning before it enters the full-rate production phase of the acquisition process.

- The NFCS Program Office efforts to develop and acquire the NFCS Phase II duplicated the existing and planned functionality of the Army Advanced Field Artillery Tactical Data System (AFATDS). As a result, the Navy, including the Marine Corps, planned to obligate $71.2 million in research, development, test and evaluation funding from FY 2002 through FY 2007 for NFCS Phase II requirements that duplicate functions of AFATDS on amphibious ships. Implementing the recommendations would permit the Navy, including the Marine Corps, to put $71.2 million of remaining funds to better use (finding A).

- The earned value management system (EVMS) for the NFCS did not provide the program office with information needed to effectively manage the program's cost and schedule data. Without a certified EVMS that accurately shows contractor cost and schedule performance data, the Navy has increased the risk of the program being adversely affected by undisclosed cost and schedule overruns (finding B).

- The NFCS did not have an updated and comprehensive operational requirements document (ORD) and test and evaluation master plan (TEMP) that included user objectives and minimum acceptable requirements for NFCS Phase I Plus and the functionality of NFCS Phase II. Without an updated and comprehensive ORD and TEMP, the Navy cannot plan for test resources required to test NFCS, thus impacting the NFCS schedule, cost, and performance, and cannot ensure that the NFCS meets the minimum required system capabilities or characteristics that are considered essential for successful mission accomplishment (finding C).

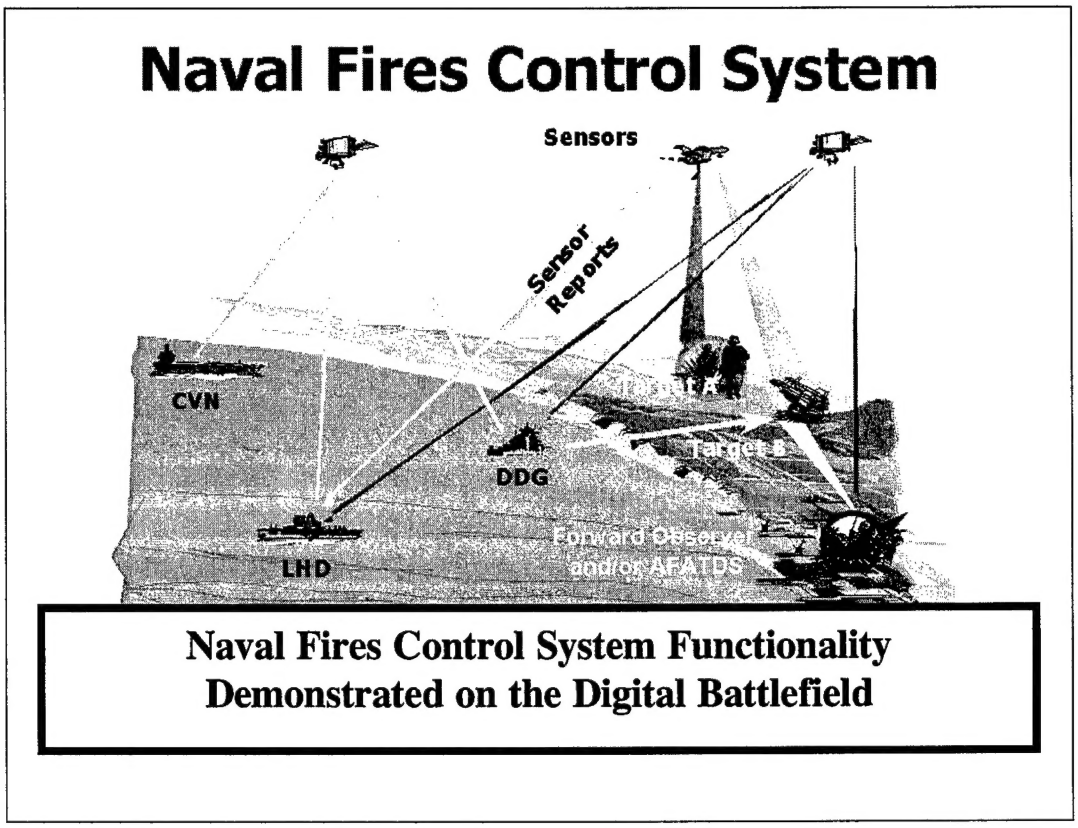
The management control program that we reviewed was effective in that no material management control weakness was identified. See Appendix A for details on the management control program.

Summary of Recommendations. We recommend that the Director, Naval Center for Cost Analysis, conduct a life-cycle cost comparison between AFATDS and NFCS to determine which system most cost-effectively meets ORD requirements, and that the Deputy Chief of Naval Operations (Naval Warfare) determine whether NFCS Phase II meets Naval doctrine to project Naval power ashore in support of the Marine Corps, whether it duplicates existing AFATDS functionality, and whether it should continue to be funded. Further, we recommend that the Program Manager, Naval Surface Fire Support, update the acquisition strategy, the acquisition plan, and the TEMP; request that the Defense Contract Management Agency conduct a certification review of the EVMS for the NFCS; and conduct periodic reviews of the EVMS. We also recommend that the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) update the ORD; and that the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) review the Command, Control, Communications, Computers, and Intelligence (C^4I) Support Plan for the NFCS to access interoperability and information exchange requirements for all phases of the program; and that the Director for Command, Control, Communications, and Computers (J-6) review and certify, as appropriate, the ORD for interoperability.

Management Comments. We received comments from the Deputy Assistant Secretary of the Navy, Ship Programs, Office of the Assistant Secretary of Navy (Research, Development, and Acquisition) (the Deputy Assistant); the Chief, Command, Control, Communications, and Computers Requirements and Assessment Division, Office of the Director for Command, Control, Communications, and Computers (J-6) in the Joint Staff (the Chief); and the Acting Director, Program Analysis and Integration, Office of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) (the Acting Director). The Deputy Assistant concurred with the intent of the recommendation to conduct a life-cycle cost comparison between AFATDS and NFCS; however, his comments were unresponsive. The Deputy Assistant also concurred with the intent of recommendations to determine whether NFCS Phase II meets Naval doctrine, whether it duplicates existing AFATDS functionality, and whether it should continue to be funded; however, the Deputy Assistant's comments did not meet the intent of our recommendations. Further, the Deputy Assistant concurred with the recommendations to update the acquisition strategy, the acquisition plan, the TEMP, and the ORD and nonconcurred with the recommendations to conduct a certification review and periodic reviews of the EVMS for the NFCS. The Deputy Assistant provided comments and recommended changes to selected statements in the report. The Chief concurred with the recommendation to review and certify, as appropriate, the ORD for the NFCS. The Acting Director concurred with the recommendation to review the C^4I Support Plan for the NFCS. A discussion of the management comments is in the Finding section of the report, and the complete text is in the Management Comments section.

Audit Response. Because the Navy comments were unresponsive to the recommendation concerning life-cycle costs, we are redirecting that recommendation to the Under Secretary of Defense for Acquisition, Technology, and Logistics. Further, as a result of the Navy comments, we revised the recommendations concerning Naval doctrine, AFATDS functionality, program funding, and EVMS to clarify our intention. Therefore, we request that the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Navy provide comments by February 8, 2002.

Table of Contents



AFATDS	Advanced Field Artillery Tactical Data System (Army)
CVN	Carrier Vessel Nuclear
DDG	Guided Missile Destroyer
LHD	Amphibious Assault Ship (Multipurpose)

Source: Surface Warfare Division, Manpower/Training Requirements Branch, Office of the Deputy Chief of Naval Operations (Naval Warfare)

Naval Fires Control System

Background

The Naval Fires Control System (NFCS), a Navy Acquisition Category III program, is one of several modernization efforts under the Program Manager, Naval Surface Fire Support (PMS 529).[1] The mission of the PMS 529 Program Office is to design, build, and field responsive, lethal, flexible, and affordable Naval surface-fire support combat systems to support Fleet operational requirements and Marine Corps concepts as described in "U.S. Marine Corps Operational Maneuver from the Sea."[2] The PMS 529 Program Office reports to the Program Executive Office for Surface Strike [PEO(S)]. On acquisition matters, PEO(S) reports directly to the Assistant Secretary of the Navy (Research, Development, and Acquisition). On in-service support matters, PEO(S) reports to the Chief of Naval Operations through the Commander, Naval Sea Systems Command. The Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) represents the user and defines NFCS operational requirements. Appendix B provides definitions of technical terms used in this report.

The NFCS is an automated mission-planning system for surface fire support that will be interoperable with Army and Marine Corps fire support systems on future, digital battlefields. The Navy was developing the NFCS to enhance supporting fire-mission planning, command and control, and coordination, which are mainly manual operations. The NFCS will coordinate and execute fire support weapon engagements from *Arleigh Burke* class destroyers and *Ticonderoga* class cruisers, receive targeting data, generate a coordinated land tactical picture, and prepare fire plans. The system is scheduled for installation aboard the USS *Winston S. Churchill* (DDG-81) and later aboard *Arleigh Burke* class Aegis guided-missile destroyers and will also be an element of the Cruiser Conversion Program for the 22 *Ticonderoga* class Aegis guided-missile cruisers fitted with the vertical launching system.

The NFCS is to be interoperable with the Army Advanced Field Artillery Tactical Data System (AFATDS), an Army Acquisition Category IC program, that is a multi-service (Army and Marine Corps), joint, and combined forces system for fire-support command, control, and communications. AFATDS provides fully automated support for planning, coordinating and controlling mortars, field artillery cannons, rockets, guided missiles, close air support, attack helicopter, and Naval gunfire, for close support, counterfire, interdiction, suppression of enemy air defenses, and deep operations. AFATDS is used at all echelons from the platoon operations center to the corps fire support element and operates with all existing and planned U.S. fire support systems as well as allied field artillery command, control, and communications systems. Under an interim fielding decision, the Navy installed AFATDS software on the USS *Bonhomme Richard* (LHD-6), the USS *Iwo Jima* (LHD-7), and the USS *Coronado* (AGF-11), a command ship.

[1]Formerly PMS 429.

[2]See finding A, page 9, for a discussion of the document.

The NFCS acquisition strategy, approved in October 1998, was for a two-phase development approach. Phase I encompasses the reuse and further development of an existing Government off-the-shelf computer program.[3] The Phase I end product would be a Government-owned, baseline NFCS computer program. Phase II incorporates additional Naval surface-fire support functional requirements into the baseline NFCS computer program. General Dynamics Information Systems[4] is the prime contractor for Phase I; however, as of December 2001, the Navy had not awarded the Phase II contract.

In November 2000, PEO(S) approved the initiation of engineering and manufacturing development for the NFCS Phase I Plus Program, which embeds Phase I software into Tactical Tomahawk Weapons Control System and Land Attack Missile Fire Control System equipment. The resulting system is known as TLN.[5] Lockheed Martin Management and Data System is the prime contractor for the NFCS Phase I Plus Program. The Navy plans to procure and maintain the NFCS for an estimated cost of $111.6 million over a 15-year life cycle and will hold the full-rate production decision in FY 2003.

Objectives

The primary audit objective was to evaluate the overall management of the NFCS. Because the program was in the engineering and manufacturing development phase, we determined whether management was cost-effectively readying the program for the production phase of the acquisition process. We also evaluated the management control program as it related to the audit objective. See Appendix A for a discussion of the audit scope and methodology, the review of the management control program, and prior coverage related to the audit objectives.

[3]The Navy selected the Automated Deep Operations Coordination System (ADOCS), a Defense Advanced Research Projects Agency and Army program, to be the foundation on which it would build the NFCS.

[4]Formerly Interactive Television Company, which General Dynamics Information Systems acquired.

[5]TLN is a compound acronym comprised of the first letter of the acronyms for the Tactical Tomahawk Weapons Control System (TTWCS), the Land Attack Missile Fire Control System (LAM FCS), and the Naval Fire Control System (NFCS).

A. Naval Fires Control System Development and Acquisition

The NFCS Program Office efforts to develop and acquire NFCS Phase II duplicated the existing and planned functionality of the AFATDS. This condition occurred because the Navy believed that the AFATDS was unacceptable for Naval use even though the AFATDS fully or mostly met 94 percent of the operational requirements document (ORD) requirements for NFCS Phase I and 100 percent for NFCS Phase II and the Marine Corps supported the AFATDS for Naval use. The Navy believed that the AFATDS was unacceptable because:

- the opportunity for AFATDS software reuse was significantly less than that of NFCS,
- AFATDS use of the Ada legacy code and the UNIX[6] operating system made program manipulation difficult, and
- the estimated life-cycle cost of the AFATDS was nearly double that of NFCS.

As a result, the Navy, including the Marine Corps, planned to obligate $71.2 million in research, development, test and evaluation funding from FY 2002 through FY 2007 for NFCS Phase II requirements that duplicate functions of AFATDS on amphibious ships.

Policy for the Acquisition Strategy, Acquisition Plan, and Analysis of Alternatives

The following provides acquisition strategy, acquisition plan, and analysis of alternatives (AoA) policy.

Acquisition Strategy. DoD Instruction 5000.2, "Operation of the Defense Acquisition System," Change 1, January 4, 2001, and Secretary of the Navy Instruction 5000.2B, "Implementation of Mandatory Procedures for Major and Non-Major Defense Acquisition Programs and Major and Non-Major Information Technology Acquisition Programs," December 6, 1996, provide acquisition strategy guidance for Navy programs.

DoD Instruction. DoD Instruction 5000.2 states that, for an evolutionary acquisition approach, the ultimate capability delivered to the user is divided into two or more blocks with increasing increments of capability. Deliveries for each block may extend over months or years.

[6]Uniplexed Information and Computer Systems

The treatment of subsequent blocks has the following two approaches.

- Each block will have a baseline, and the acquisition strategy will define each block of capability and how it will be funded, developed, tested, produced, and operationally supported.

- The acquisition strategy will define the first block of capability and how it will be funded, developed, tested, produced, and supported; the full capability that the evolutionary acquisition is intended to satisfy and the funding and schedule planned to achieve the full capability to the extent that they can be described; and the management approach to be used to define the requirements for each subsequent block and the acquisition strategy applicable to each block, including whether end items delivered under earlier blocks will be retrofitted with later block improvements.

Navy Instruction. Secretary of the Navy Instruction 5000.2B states that the program managers for all Navy programs will develop an acquisition strategy by implementing the requirements of DoD Regulation 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs."[7] The Regulation describes the relationship of the essential elements of a program including: requirements, program structure, acquisition approach, risk, program management, design considerations, support strategy, and business strategy.

Acquisition Plan. Secretary of the Navy Instruction 5000.2B states that the acquisition plan will meet Federal Acquisition Regulation requirements. The Federal Acquisition Regulation states that the acquisition plan must identify those milestones at which decisions should be made and must address all the technical, business, management, and other significant considerations that will control the acquisition.

Analysis of Alternatives. DoD Instruction 5000.2 and Secretary of the Navy Instruction 5000.2B provide guidance for an AoA for Navy programs.

DoD Instruction. DoD Instruction 5000.2 states that the concept to exploit in systems acquisition is based on an AoA to determine ways to meet the military need, including commercial and nondevelopmental technologies and products and services determined through a market analysis. The DoD Component responsible for the mission area in which a deficiency or opportunity has been identified, not the program manager, will normally prepare the AoA. However, program managers or their representative may participate in the analysis. Further, the Instruction states that the goal is to develop the best overall value solution over the system's life cycle that meets the user's operational requirements. Generally, the use or modification of systems or equipment that the DoD Components already own is more cost- and schedule-effective than acquiring new materiel. If existing military systems or other on-hand materiel cannot be economically used or modified to meet the

[7]The latest version of DoD Regulation 5000.2-R was dated June 10, 2001.

operational requirement, an acquisition program may be justified and acquisition decisionmakers will follow a hierarchy of alternatives. Important in this evaluation process are considerations for interoperability and supportability with existing and planned future components or systems.

Navy Instruction. Secretary of the Navy Instruction 5000.2B defines the AoA development and coordination procedures for weapons systems and information technology programs. The analysis process provides a forum for involving the Chief of Naval Operations, the Commandant of the Marine Corps, and the acquisition community, as applicable, in the analysis of alternative discussions. The intent of an AoA is twofold:

- to aid in the resolution of milestone decision authority issues and
- to provide analytical insight and the basis for operational performance characteristics.

The milestone decision authority, or designee, and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) approves the scope of an AoA for Acquisition Category III programs. At the end of the analysis process, the organization responsible for conducting the AoA presents a final briefing of analysis results to the AoA integrated product team. If required, the milestone decision authority and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) approve the AoA final report. Appendix C provides a flow chart of the process.

Efforts to Develop and Acquire NFCS

The NFCS Program Office efforts to develop and acquire the NFCS Phase II duplicated the existing and planned functionality of the AFATDS. This condition occurred because the Navy stated in the NFCS acquisition strategy and acquisition plan that the AFATDS was unacceptable for Naval use. However, the AoA showed that AFATDS fully or mostly met 94 percent of the ORD requirements for Phase I and 100 percent for Phase II and that the Marine Corps supported the AFATDS for Naval use.

Acquisition Strategy. The "NFCS Acquisition Strategy," October 7, 1998, stated that an engineering analysis of Government-off-the-shelf programs conducted by the Space and Naval Warfare Systems Center San Diego determined that the Automated Deep Operations Coordination System (ADOCS) contained a majority of the NFCS required functionality and that ADOCS was selected to be the foundation on which the Navy would build the NFCS. The Navy uses a variant of ADOCS, called Land Attack Warfare System (LAWS) in its Fleet battle experiments to gain Fleet input and potential requirements.

Further, the acquisition strategy stated that AFATDS, which was the other system examined in the engineering analysis, was unacceptable for Navy use because:

- the opportunity for AFATDS software reuse was significantly less than that of NFCS,
- the use of the Ada programming language and the UNIX operating system made program manipulation difficult,[8] and
- the estimated life-cycle cost of AFATDS was nearly double that of NFCS.

The acquisition strategy stated that the Center for Naval Analyses would conduct an AoA for which the scope would be defined by the Office of the Deputy Chief of Naval Operations (Naval Warfare) to include the engineering analysis by the Space and Naval Warfare System Center San Diego and the ORD key performance parameters for NFCS. Further, the acquisition strategy anticipated a sole-source contract with General Dynamics Information Systems for the NFCS Phase I Program. During the contract, the contractor would modify ADOCS to support NFCS requirements. The acquisition strategy also states that requirements definition for Phase II would begin in FY 1999 and that the acquisition strategy would be reviewed at least annually. On November 18, 2000, the PEO(S) issued a memorandum that revised the exit criteria for entering NFCS Phase II and granted approval to begin engineering and manufacturing development for the NFCS Phase I Plus; however, the NFCS Program Office had not updated the acquisition strategy to define the engineering and manufacturing development phase for NFCS Phase I Plus.

Software Reuse. In an April 1998 memorandum, the Space and Naval Warfare System Center San Diego stated that reusing ADOCS software for NFCS was cheaper and faster because ADOCS executes on a Windows NT™ workstation and AFATDS does not. Instead, AFATDS executes on a UNIX platform and could encounter problems when moved to a Windows NT™ workstation. Although AFATDS software reuse was a potential problem for NFCS Phase I, it should not be a problem for NFCS Phase II because:

- AFATDS fully or mostly met 100 percent of the ORD requirements, as discussed in the March 25, 1999, AoA;[9] and
- the AFATDS contractor was developing modules that would operate on a Windows™ based operating system.

[8]In August 2001, the SSC-SD stated that the Ada programming language was the problem and not the use of the UNIX operating system.

[9]In August 2001, the NFCS Program Office stated that it believed that AFATDS fully or mostly supports 100 percent of the NFCS Phase II requirements in the ORD with the exception of critical gun and missile fire control interfaces even though the AoA did not address this belief.

Programming Language. The Space and Naval Warfare System Center San Diego further stated in its April 1998 memorandum that programming in "C++" was preferable to programming in the Ada programming language because:

- higher quality and less expensive programming tools were available for "C++,"
- using "C++" would avoid introducing mixed language problems, and
- finding skilled "C++" programmers was easier than finding skilled Ada programmers.

In determining whether "C++" was of higher quality and less expensive, the Center for Naval Analyses concluded in its March 1999 AoA for the NFCS that practical comparisons of programming languages were difficult to achieve because large software projects are not performed in parallel to determine which language or programming tool is better and that determining which language to use is subjective. However, detailed comparisons of a few cases gave the advantage to Ada in reliability, maintainability, and modular design.

Concerning mixed languages and programmers, the Center for Naval Analyses stated in its March 1999 AoA that the commercial world used "C++" and Ada programming languages, and that writing code in "C++" was generally easier. However, the AoA concluded that writing bug-free code in Ada was easier and that, although Ada programmers were fewer than "C++" programmers, they were available. Because the ORD requires that NFCS interface with AFATDS and other command and control systems, the Navy had already introduced multiple programming languages associated with those systems.

Estimated Life-Cycle Cost. In an October 1998 memorandum, the Space and Naval Warfare System Center San Diego estimated the life-cycle development and maintenance cost to produce the NFCS and the AFATDS over a 15-year life cycle to be $111.6 million and $254.6 million, respectively. Space and Naval Warfare System Center San Diego personnel stated that the AFATDS estimate was based on discussions with Space and Naval Warfare System Center San Diego staff who had worked on AFATDS and was not based on data from the Army because such data was unavailable. Further, Space and Naval Warfare System Center San Diego personnel stated that the life-cycle cost estimate for NFCS was no longer valid and should not be used as a basis for current decisionmaking because the estimate was based on the Software Requirements Specification for the Naval Surface Fire Support Warfare Control System[10] instead of the ORD. The Space and Naval Warfare System Center San Diego staff recommended that an independent third party, such as the Naval Center for Cost Analysis, conduct a cost comparison between AFATDS and NFCS using updated life-cycle cost estimates. The Project Manager, AFATDS, stated that, when comparing the life-cycle cost estimates for the AFATDS and the NFCS, the Navy should compare only those costs that represent

[10]Renamed NFCS in FY 1998.

Navy-unique requirements or interfaces because the Army will absorb the costs for functionality and interface requirements that are common to the Army and the Navy. Further, the Project Manager, AFATDS, believes that:

- Navy-unique costs of using AFATDS to accomplish the NFCS Phase II requirements would be significantly less than cost estimates for NFCS Phase II, and

- the Navy would have instant fire support digital compatibility with the Marine Corps and the Air Force that have AFATDS and the Theater Battle Management Core System,[11] respectively.

Acquisition Plan. The NFCS Acquisition Plan, December 7, 1998, details the design, development, and manufacture of the NFCS and restates the comments made in the acquisition strategy about AFATDS software reuse, legacy code use, and an estimated life-cycle cost of $200 million over a 15-year life cycle. The acquisition plan states that the Center for Naval Analyses, in conjunction with the AoA for NFCS, was conducting a life-cycle cost estimate for various development options that would be available in early 1999. In the AoA briefing charts, the Center for Naval Analyses did not provide a total life-cycle cost estimate for NFCS. However, on May 13, 1999, the NFCS Program Office prepared a life-cycle cost estimate for the design, development, test and evaluation, production, Fleet introduction, and sustainment of Fleet support for the NFCS Phase I over a 15-year period, totaling $107.7 million (FY 1999).[12] The Center for Naval Analyses examined the portion of the life-cycle cost estimate that deals with Phase I program development and determined that those costs were reasonable, though containing some risk, which the Program Manager, PMS 529, determined to be acceptable.

For NFCS Phase II, the acquisition plan states that the Phase II contract would use the delivered Phase I software product. However, the acquisition plan did not define the engineering and manufacturing development phase for NFCS Phase I Plus, as discussed in PEO(S) memorandum, November 18, 2000. Before the PEO(S) memorandum, the NFCS Program Office issued an acquisition plan for NFCS Phase I Plus and the Land Attack Missile Fire Control System, which the Navy approved on August 31, 2000. This acquisition plan addresses the implementation of NFCS Phase I Plus and the Land Attack Missile Fire Control System capability but did not address the NFCS Phase II.

Analysis of Alternatives. The Center for Naval Analyses conducted the AoA for the NFCS and, on March 2, 1999, briefed the Deputy Program Executive Officer, Theater Surface Combatants, on its preliminary results. On March 25, 1999, the Center for Naval Analyses provided a final AoA in the form of

[11]The Theater Battle Management Core System provides command and control and Air Tasking Order generation, situational awareness and current intelligence data, and a common communication network for use at Air Force wings.

[12]This amount did not include Phase II cost estimates and subsystems and components for which support funding is the responsibility of another project office.

briefing charts,[13] which concluded that AFATDS was substantially closer to meeting ORD requirements because AFATDS fully or mostly met 94 percent of those requirements for Phase I and 100 percent for Phase II. The briefing charts provided the advantages and disadvantages of the LAWS and AFATDS as candidates for NFCS; however, the charts did not provide a recommendation because a recommendation was not required in the AoA scope.

Based on the March 2, 1999, briefing and a strong recommendation from the PMS 529 Program Office, the Deputy Program Executive Officer, Theater Surface Combatants, selected the LAWS/ADOCS approach for NFCS Phase I. The Deputy Program Executive Officer and the PMS 529 Program Office supported the selection of the LAWS/ADOCS approach because it uses a newer source code; runs on a windows-based operating system; was recommended by the Space and Naval Warfare System Center San Diego; and is user friendly, interoperable with AFATDS, and used by the Fleet. Further, the PMS 529 Program Office stated that the LAWS/ADOCS approach for NFCS Phase I was low risk, will keep the program timeline on track, and meet Navy requirements. Additionally, the PMS 529 Program Office was working with the Project Manager, AFATDS, on possible future uses of AFATDS for more complex Naval fires coordination functions.

AFATDS Interface With NFCS

To accomplish its operational maneuver from the sea objectives, the Marine Corps needs an interface between AFATDS and sea-based fire support by FY 2004. NFCS Phase I, as planned, should provide that interface. If the Navy deploys subsequent phases of NFCS to the Marine Corps, the decision will affect Marine Corps training and personnel as well as its Supporting Arms Coordination Center (SACC).

Operational Maneuver From the Sea. On June 16, 1999, the Commanding General, Marine Corps Combat Development, issued a memorandum that discussed the Marine Corps' requirements for Naval surface-fire support. The Marine Corps did not envision Naval surface-fire support, which includes NFCS, replacing a robust expeditionary artillery capability once it was ashore, but rather supplementing the organic fires of the Marine Corps forces with deep fires and counterfire. Central to an effective Naval fire support system is the ability of the commander, who is responsible for the mission, to plan, allocate, control, and coordinate fires from all available systems. Because that responsibility may shift between the Navy and the landing force commander during operations, the information must be shared and air and surface fires coordinated, not only between the Navy and the landing force, but with higher and adjacent units as well, whether they are Naval or joint Service. Navy shipboard command and control systems must be fully functional and interoperable with Marine Corps command and control systems, including AFATDS. Naval surface-fire support platforms and amphibious ships must be able to access, input, receive, process, and disseminate information to and from

[13]The Center for Naval Analysis was not required to follow up the March 25, 1999, briefing charts with a formal report for the AoA.

AFATDS. To be a complete system that effectively supports the land forces, all target acquisition elements of the fire support system must be directly tied into AFATDS, the fire support command and control network.

Training and Personnel. Marine Corps personnel receive extensive training with Army personnel in the use of AFATDS at Fort Sill, Oklahoma. Once the Marines are trained, operation of AFATDS is their primary duty. Therefore, if the Navy deploys NFCS to the Marine Corps, the Marines will require additional training to achieve NFCS proficiency. Even if the Marine Corps receives the NFCS, it still needs AFATDS to be interoperable with Army units for automated command, control, and communications fire support.

Supporting Arms Coordination Center. The SACC provides centralized and coordinated fire support of the artillery, air, and Naval gunfire. The Navy had installed and planned to install AFATDS in the SACC on selected amphibious assault ships as an interim system until a decision is made on a designated future system. Once the Marines go ashore from the amphibious ships, they establish the Fire Support Coordination Center[14] using AFATDS and the SACC becomes a backup system on the amphibious ship to monitor fire missions. If the Fire Support Coordination Center is destroyed, the SACC becomes the primary coordination center between forces ashore and naval gunfire. Consequently, if NFCS Phase II is installed on the amphibious assault ships, which already have AFATDS, the Marines must maintain two systems for fire mission planning and coordination.

Effect of Continuing NFCS Development

By not ensuring that efforts to develop and acquire the NFCS Phase II did not duplicate the existing and planned functionality of the AFATDS on amphibious ships, the Navy, including the Marine Corps, will obligate another $71.2 million in research, development, test and evaluation funding from FY 2002 through FY 2007 for NFCS Phase II that duplicates the SACC functionality of the AFATDS.

Efforts to Develop and Acquire the NFCS. After the completion of Phase I and Phase I Plus, the Project Manager, NFCS, planned to spend $50.9 million in research, development, test and evaluation funding from FY 2002 through FY 2007 for SACC requirements, as part of NFCS Phase II. Those efforts to meet SACC requirements will duplicate the SACC functionality of the AFATDS. Further, the Marine Corps planned to spend $20.3 million in research, development, test and evaluation funding from FY 2002 through FY 2005 for developing and procuring NFCS for amphibious ships to meet SACC requirements as part of a collaboration between the Expeditionary Warfare and Surface Warfare Divisions, Office of the Deputy Chief of Naval Operations (Naval Warfare), to jointly develop and field NFCS to satisfy Naval doctrine to project Naval power ashore in support of the Marine Corps. The Navy will fund and devise a strategy for the NFCS Phase II on amphibious ships

[14]The Fire Support Coordination Center is a single location in which are centralized communications facilities and personnel to coordinate all forms of fire support.

in FY 2002 and for cruisers and destroyers in FY 2004. The NFCS Phase II effort for cruisers and destroyers will consider software reuse of AFATDS functionality built on the NFCS Phase I product to meet NFCS Phase II requirements.

Funds Put to Better Use. The Navy, including the Marine Corps, could put $71.2 million[15] of remaining research, development, test and evaluation funds to better use if the Navy determines that:

- NFCS Phase II duplicates the SACC functionality of the AFATDS on selected amphibious ships, and
- AFATDS is a more cost-effective alternative for satisfying NFCS Phase II requirements.

Management Comments on the Finding and Audit Responses

Summaries of management comments on the finding and our responses are in Appendix D.

Recommendations, Management Comments, and Audit Responses

Redirected and Revised Recommendations. Because the Navy comments did not meet the intent of Recommendations A.1. and A.2., we redirected and revised those recommendations, respectively. For Recommendation A.1., we redirected the recommendation from the Director, Naval Center for Cost Analysis, to the Under Secretary of Defense for Acquisition, Technology, and Logistics, to ensure that the Navy properly conducts an updated life-cycle cost comparison between AFATDS and NFCS. For Recommendation A.2., we revised the recommendation to clarify the actions needed to ensure that the Navy properly determines whether NFCS Phase II meets Naval doctrine, whether it duplicates existing AFATDS functionality, and whether it should continue to be funded.

A.1. We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics require the Assistant Secretary of the Navy (Research, Development, and Acquisition) to direct the Naval Center for Cost Analysis to conduct a life-cycle cost comparison between the Army Advanced Field Artillery Tactical Data System and the Naval Fires Control System to determine which system most cost-effectively meets the

[15]Of the $71.2 million in research, development, test and evaluation funding, the Navy and the Marine Corps planned a total of $50.9 million and $20.3 million, respectively, for the NFCS Phase II SACC requirements in FYs 2003 through 2007, and FYs 2002 through 2005, respectively. The Navy research, development, test and evaluation funding includes $2.0 million in FY 2003, $9.6 million in FY 2004, $15.3 million in FY 2005, $14.0 million in FY 2006, and $10.0 million in FY 2007. The Marine Corps research, development, test and evaluation funding includes $5.8 million in FY 2002, $7.4 million in FY 2003, $6.9 million in FY 2004, and $0.2 million in FY 2005.

requirements in the operational requirements document for the Naval Fires Control System Phase II and provide the results to the Deputy Chief of Naval Operations (Naval Warfare) and the Program Manager, Naval Fires Control System (PMS 529).

Management Comments. The Deputy Assistant Secretary of the Navy, Ship Programs, Office of the Assistant Secretary of the Navy (Research, Development, and Acquisition), concurred with the intent of the recommendation, stating that the Navy understands that the AFATDS is being upgraded to make the code more transportable. Further, the Deputy stated that the Office of the Chief of Naval Operations is updating the ORD for the NFCS and will evaluate the updated AFATDS against the NFCS Phase II requirements. The Deputy also stated that, if the updated AFATDS is determined to be a viable alternative for NFCS, a life-cycle cost analysis would be appropriate. For the complete text of the Deputy's comments, see the Management Comments section of this report.

Audit Response. The Navy comments were not responsive. A comparison between AFATDS and NFCS life-cycle costs, which was not based on objective data, was one of the reasons why the Navy did not choose AFATDS to meet the user's operational requirements. However, because AFATDS fully or mostly met 94 percent of the ORD requirements for Phase I and 100 percent for Phase II and the Marine Corps supported the AFATDS for Naval use, AFATDS clearly is a viable alternative unless the Navy develops completely new requirements in its updated ORD for NFCS. Therefore, the primary issue is cost effectiveness, making a life-cycle cost analysis appropriate. Without an updated life-cycle cost comparison between AFATDS and NFCS in the Navy's evaluation of the updated AFATDS against the NFCS Phase II requirements, the Navy cannot determine which system is the most viable and cost-effective to meet the user's operational requirements. Therefore, we request that the Under Secretary of Defense for Acquisition, Technology, and Logistics comment on this recommendation and direct the Navy to conduct an updated life-cycle cost comparison between AFATDS and NFCS to ensure that the Navy determines which system most cost-effectively meets the requirements in the updated ORD for NFCS Phase II.

A.2. We recommend that the Deputy Chief of Naval Operations (Naval Warfare) determine whether Phase II of the Naval Fires Control System in the updated operational requirements document meets Naval doctrine to project Naval power ashore in support of the Marine Corps, whether it duplicates existing Army Advanced Field Artillery Tactical Data System functionality, and whether it should continue to be funded by the Navy.

Management Comments. The Deputy Assistant Secretary of the Navy, Ship Programs, concurred with the intent of the recommendation, stating that the Office of the Chief of Naval Operations concluded that NFCS Phase II met the Naval doctrine requirements for fire support in support of ground forces ashore. In addition, the Deputy restated the comments in the report on why AFATDS was not chosen during the NFCS Phase I program selection. Further, the Deputy stated that, since the NFCS Phase I selection, the Navy understands that the AFATDS is being upgraded to make the code more transportable, and that the Office of the Chief of Naval Operations is updating the ORD for the NFCS

and will evaluate the updated AFATDS against the NFCS Phase II requirements. The Deputy also stated that the Navy must continue to fund the NFCS Phase II functionality to support the evolving expeditionary maneuver concepts of the Marine Corps.

Audit Response. The Navy comments were not responsive. The conclusion by the Office of the Chief of Naval Operations that NFCS Phase II meets the Naval doctrine requirements for fire support in support of ground forces ashore appears to be premature. The Surface Warfare Division, Office of the Deputy Chief of Naval Operations (Naval Warfare), is updating the ORD for the NFCS to include development of NFCS Phase II requirements, evolving Marine Corps doctrine, and improved Naval surface-fire support capabilities, as discussed by the Deputy in his response to Recommendation C.1. Further, the continued funding of NFCS Phase II functionality is a potential waste of funds because NFCS Phase II duplicates the existing and planned SACC functionality of the AFATDS on amphibious ships. Therefore, after the Navy updates the ORD for the NFCS, we request that the Deputy Chief of Naval Operations (Naval Warfare) reconsider the Office of the Chief of Naval Operations' conclusion that NFCS Phase II met the Naval doctrine requirements for fire support in support of ground forces ashore and determine whether NFCS Phase II duplicates existing AFATDS functionality and should continue to be funded.

A.3. We recommend that the Program Manager, Naval Fires Control System (PMS 529), update the acquisition strategy to incorporate Phase I Plus of the Naval Fires Control System and update the acquisition strategy and the acquisition plan with the results of the Deputy Chief of Naval Operations (Naval Warfare) review and the Director, Naval Center for Cost Analysis, life-cycle cost comparison.

Management Comments. The Deputy Assistant Secretary of the Navy, Ship Programs, concurred, stating that further definition of NFCS Phase I Plus requirements may not be required because of potential changes to the Land Attack Missile program. Further, the Deputy stated that the Navy will update the acquisition strategy and the acquisition plan to include NFCS Phase I Plus, if required, and to include future program phases before beginning Phase II engineering and manufacturing development. The Deputy also stated that the cruiser-destroyer ships will continue to use an NFCS-based solution and will consider reusable AFATDS software segments, if available for NFCS Phase II. In addition, the Deputy stated that the Program Manager, Expeditionary Warfare Life-Cycle Support, is developing an acquisition strategy and acquisition plan to meet the Fires Coordination Element Required Capabilities in the ORD for the NFCS.

B. Earned Value Management System

The earned value management system (EVMS) for the NFCS did not provide the program office with information needed to effectively manage the program's cost and schedule data. This condition occurred because:

- the Defense Contract Management Agency did not certify the EVMS, and
- the NFCS Program Office did not provide oversight to ensure the validity of contractor cost and schedule performance data.

Without a certified EVMS that accurately shows contractor cost and schedule performance data, the Navy increased the risk of the program being adversely affected by undisclosed cost and schedule overruns.

Earned Value Management Guidance

The "Earned Value Management Implementation Guide," Revision 1, October 3, 1997, provides guidance to be used during the implementation and surveillance of the EVMS. The Guide states that earned value management is a tool that allows Government and contractor program managers to have visibility into technical, cost, and schedule progress on their contracts. Implementation of an EVMS integrates cost, schedule, and technical aspects of the contract and provides the program manager with contractor cost and schedule performance data that:

- relates time-phased budgets to specific contract tasks or statements of work, or both;
- indicates work progress;
- properly relates cost, schedule, and technical accomplishments;
- are valid, timely, and auditable;
- provides managers with summarized information at a practical level; and
- are derived from the same internal EVMS that the contractor uses to manage the contract.

The DoD formally recognizes industry-standard criteria as defining acceptable EVMS requirements, which are outlined in DoD Regulation 5000.2-R.

Analysis of Contractor Earned Value Management System

The Defense Contract Management Agency did not certify the EVMS for the NFCS, and the NFCS Program Office did not provide oversight to ensure the validity of contractor cost and schedule performance data.

Defense Contract Management Agency. The program integrator at the Defense Contract Management Agency, who is responsible for NFCS oversight, stated that the contractor's EVMS had not been certified. Further, he stated that Defense Contract Management Agency personnel had not reviewed NFCS cost and schedule performance data because the NFCS Program Office and the Defense Contract Management Agency did not have a memorandum of agreement between them to conduct the certification and reviews. On June 11, 2001, the Project Manager, NFCS, stated that he would request that the Defense Contract Management Agency conduct a review of the contractor's EVMS and monthly reports. However, in August 2001, the NFCS Program Office stated that it did not believe that certification would be an efficient use of program resources because:

- the NFCS Phase I contract would end in April 2002 and
- the system in place provided satisfactory, tailored EVMS data.

NFCS Program Office. The NFCS Program Office did not validate the contractor's EVMS data because it believed that Defense Contract Management Agency personnel were conducting the validation and because the requirements for cost and schedule performance data were tailored to accommodate the contractor's inexperience and the size of the program, which is an Acquisition Category III program.

Continuing Earned Value Management System Without Oversight

Without a certified EVMS that accurately shows contractor cost and schedule performance data, the Navy increased the risk of the program being adversely affected by undisclosed cost and schedule overruns. Further, the Navy cannot ensure that contractor cost and schedule performance data properly relate time-phased budgets to specific contract tasks or statements of work, or both, and cost, schedule, and technical accomplishments. For example, the contractor could not show how much time or cost had been spent to conduct coding and testing on each of 45 software packages. Therefore, the NFCS Program Office was solely reliant upon contractor information and could not evaluate the software other than by testing. As another example, the contractor did not appropriately classify costs in its EVMS reports for its quality assurance reviews, which consisted primarily of grammatical changes to documents. When questioned about software quality assurance, the contractor stated that costs associated with that effort were included under the software development

element and not quality assurance. According to the program integrator, the contractor could mislead the Government on its actual progress and postpone cost overruns indefinitely by not appropriately classifying costs in its EVMS.

Management Comments on the Finding and Audit Responses

Summaries of management comments on the finding and our responses are in Appendix D.

Recommendations, Management Comments, and Audit Response

Revised Recommendation. Because the Navy comments did not meet the intent of Recommendations B.1. and B.2., we revised those recommendations to clarify the actions needed to ensure that the EVMS for Phase I Plus and future NFCS contracts, as applicable, are in accordance with DoD Regulation 5000.2-R so that the program manager can obtain integrated cost and schedule performance data that meet EVMS guidelines to effectively monitor program execution.

B. We recommend that the Program Manager, Naval Fires Control System (PMS 529):

1. Request that the Defense Contract Management Agency conduct certification reviews of the Phase I Plus and future Naval Fires Control System contracts that require an earned value management system, in accordance with DoD Regulation 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs," June 10, 2001.

2. Conduct periodic reviews of future Naval Fires Control System contracts with a required earned value management system to validate contractor cost and schedule performance data.

Management Comments. The Deputy Assistant Secretary of the Navy, Ship Programs, Office of the Assistant Secretary of Navy (Research, Development, and Acquisition), nonconcurred, stating that the NFCS Phase I Plus contract ends in April 2002; therefore, a certification review would not be an efficient use of program resources. Further, the Deputy stated that the existing system provides satisfactory, tailored EVMS data and is in accordance with the requirements of DoD Regulation 5000.2-R for an Acquisition Category III program contract value; consequently, no further action is required. For the complete text of the Deputy's comments, see the Management Comments section of this report.

Audit Response. The Navy comments did not meet the intent of the recommendations. To state that the existing system provides satisfactory, tailored EVMS data and is in accordance with DoD Regulation 5000.2-R requirements has no basis in fact if the Navy has not conducted an independent

certification review of the system to ensure that it meets EVMS guidelines. Further, it is the NFCS Phase I contract that ends in April 2002 and not the NFCS Phase I Plus contract, which does not end until February 2004, according to the NFCS Program Office.

During the audit, the Project Manager, NFCS, stated that he would request the Defense Contract Management Agency to conduct a review of the contractor's EVMS; however, he later decided not to request the review, citing reasons similar to those discussed by the Deputy. As a consequence of that delay, the time remaining before the Phase I contract ends in April 2002 is not enough to conduct a review. However, for the Phase I Plus and future NFCS contracts with EVMS, as applicable, the Navy should:

- request that the Defense Contract Management Agency conduct a certification review of the EVMS, in accordance with DoD Regulation 5000.2-R, at the time that the Navy awards the contract, and

- conduct periodic reviews to validate contractor cost and schedule performance data.

If the Navy does not conduct a certification review of the EVMS for the NFCS and does not conduct periodic reviews of the system to validate contractor cost and schedule performance data, the Navy cannot ensure that the contractor's EVMS is producing data that accurately indicate work progress; properly relate cost, schedule, and technical accomplishments; and are valid, timely, and auditable. Therefore, we request that the Deputy reconsider his response concerning certification reviews of Phase I Plus and future NFCS contracts with EVMS and periodic reviews of the system to validate contractor cost and schedule performance data.

C. Updated Operational Requirements and Test and Evaluation Planning

The NFCS did not have an updated and comprehensive ORD and TEMP that included user objectives and minimum acceptable requirements for NFCS Phase I Plus and the functionality of NFCS Phase II. This condition occurred because the Deputy Chief of Naval Operations (Naval Warfare) and PMS 529 did not update the ORD and the TEMP, respectively, to include Phase I Plus after the NFCS changed from two phases, Phase I and II, to three phases, Phase I, Phase I Plus, and Phase II. Without an updated and comprehensive ORD and TEMP that accurately show user and test and evaluation requirements for Phase I Plus and the functionality of NFCS Phase II, the Navy cannot plan for test resources required to test NFCS, thus impacting the NFCS schedule, cost, and performance; and cannot ensure that the NFCS meets minimum required system capabilities or characteristics considered essential for successful mission accomplishment.

Operational Requirements, Interoperability, and Test and Evaluation Policy

The following provides an overview of DoD, Navy, and Joint Staff policy concerning operational requirements, interoperability, and test and evaluation.

Operational Requirements Policy. DoD Instruction 5000.2; DoD Regulation 5000.2-R; Secretary of the Navy Instruction 5000.2B; and Chairman of the Joint Chiefs of Staff Instruction 3170.01B, "Requirements Generation System," April 15, 2001, provide policy on operational requirements.

DoD Policy. The policy requires the user or the user's representative to prepare the ORD based on validated needs to address mission area deficiencies, evolving threats, and emerging technologies or weapon system improvements.

Navy Policy. The policy states that the Chief of Naval Operations or the Commandant of the Marine Corps, or both, are responsible for the Navy requirements generation process, operational test and evaluation, readiness, planning, and programming to satisfy operational requirements, and for providing acquisition logistics support.

Joint Staff Policy. The policy states that failure to meet an ORD key performance parameter threshold can be cause for the system selection to be re-evaluated or the program to be reassessed or terminated.

Interoperability Policy. DoD Instruction 5000.2; DoD Regulation 5000.2-R; Secretary of the Navy Instruction 5000.2B; Chairman of the Joint Chiefs of Staff Instruction 3170.01B; and Chairman of the Joint Chiefs of Staff Instruction 6212.01B, "Interoperability and Supportability of National Security Systems, and Information Technology Systems," May 8, 2000, provide policy on interoperability.

DoD Policy. The policy requires the program manager to address compatibility, interoperability, and integration key goals for all acquisition programs and to ensure that these goals are achieved throughout the acquisition life cycle for all acquisition programs. Further, the policy requires the Joint Interoperability Test Command to test and certify all Command, Control, Communications, Computers, and Intelligence (C^4I) systems having joint interoperability requirements before the production milestone decision.

Navy Policy. The policy states that Navy testers will use critical operational issues for joint interoperability to address effectiveness during operational testing for programs with joint interoperability requirements identified in the ORD.

Joint Staff Policy. The policy states that interoperability key performance parameters in an ORD define the level of interoperability for the proposed system and that ORDs must be certified before each milestone, regardless of acquisition category, for conformance with joint national security systems and interoperability standards. Further, the policy states that the Defense Information Systems Agency and the Joint Interoperability Test Command (JITC) must certify test results for all interoperability system tests. In addition, the policy states that the U.S. Joint Forces Command will comment on interoperability issues for Acquisition Category III programs.

Test and Evaluation Policy. DoD Instruction 5000.2, DoD Regulation 5000.2-R, Secretary of the Navy Instruction 5000.2B, and Chairman of the Joint Chiefs of Staff Instruction 6212.01B provide policy concerning test and evaluation.

DoD Policy. The policy states that the test and evaluation master plan (TEMP) provides a framework to generate detailed test and evaluation plans for tests that the program office requires before key program decision points and identifies developmental and operational tests and evaluations needed to support the decisions.

Navy Policy. The policy states that TEMPs are required for all Navy acquisition category programs. Further, the policy states that the ORD will show the changes to system requirements before TEMP update or revision.

Joint Staff Policy. The policy states that Commanders-in-Chief, Military Departments, and agencies will incorporate interoperability testing into their overall testing plans in coordination with the Defense Information Systems Agency and JITC.

Current and Viable Test and Evaluation Master Plan

The ORD and the TEMP for NFCS were not updated to include operational, interoperability, and test and evaluation requirements after the PEO(S) changed the NFCS from two phases, Phase I and II, to three phases, Phase I, Phase I Plus, and Phase II.

Operational Requirements. On July 1, 1999, the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) issued the ORD, which described the NFCS in two phases, Phase I and II, and discussed time-phased requirements to achieve a full-land attack warfare capability. On November 18, 2000, the PEO(S) revised the exit criteria for NFCS Phase I and granted approval to begin engineering and manufacturing development for NFCS Phase I Plus. However, the Deputy Chief of Naval Operations did not update the ORD to include operational requirements for NFCS Phase I Plus. Phase I Plus encompasses part of the ORD Phase II requirements. As a result, Phase II requirements, as well as Phase I Plus requirements, were not clearly defined in the ORD. Additionally, the ORD needs to be updated with the revised evolutionary approach to include how the Navy will provide NFCS functionality to all Naval platforms that will support the operational command, control, and coordination of Naval fires. Those platforms include destroyers, cruisers, and amphibious ships on which the Navy plans to install NFCS. The Navy may also install NFCS on command ships, submarines, and the proposed *Zumwalt* Class (DD-21) destroyers, if required. The NFCS Program Office was planning to install NFCS only on destroyers and cruisers, and possibly amphibious ships. In August 2001, the NFCS Program Office stated that it will address NFCS Phase I Plus in a revised ORD and TEMP for a NFCS Phase I follow-on operational test and evaluation in February 2004.

Interoperability Requirements. The ORD for the NFCS did not include an interoperability key performance parameter(s) even though NFCS did have a C^4I Support Plan. Further, the Navy had not incorporated the fire support functionality requirements from the USS *Coronado* Fleet battle experiments into the ORD for the NFCS.

Key Performance Parameters. Chairman of the Joint Chiefs of Staff Instruction 6212.01B requires the Director for Command, Control, Communications, and Computers (J-6) to certify ORDs, regardless of acquisition-category level, before each milestone for conformance with interoperability standards and for inclusion of interoperability key-performance parameters that are derived from information exchange requirements. As part of the review process, J-6 requests assessments from the Military Departments, the Defense Information Systems Agency, and DoD agencies. Interoperability is critical because the NFCS is to operate with other Military Department systems that conduct fire-mission planning and coordination.

As of December 2001, the Navy had not complied with the Joint Requirements Oversight Council Memorandum, "Policy for Updating Operational Requirements (ORDs) to Incorporate Interoperability Key Performance Parameter (KPP) and Cost," November 16, 1999. The memorandum required DoD Components to:

- identify information exchange requirements, which support development of interoperability key performance parameters in ORDs; and

- update ORDs by March 1, 2001, that support an engineering and manufacturing development or production decision after March 1,

2001, to comply with Chairman of the Joint Chiefs of Staff Instruction 3170.01A, "Requirements Generation System," August 10, 1999.[16]

Because the Navy did not update the ORD as required, J-6 was not able to review the ORD and coordinate it with the U.S. Joint Forces Command, the Military Departments, Commanders-in-Chief, and Defense agencies. Without such coordination, the J-6 had not obtained critical warfighter perspectives on joint operational concepts; joint interface requirements with other systems, such AFATDS; and critical technical reviews. Until the ORD is updated and approved, the Navy cannot approve the TEMP, which provides the overall structure and objectives for the initial operational test and evaluation to determine whether the NFCS meets user operational requirements. In August 2001, the NFCS Program Office stated that it will add an interoperability key performance parameter when it updates the ORD for the NFCS. In the interim, interoperability and interface requirements are defined in interface control documents.

C^4I Support Plan. Although the ORD for the NFCS did not include interoperability key performance parameters, the C^4I Support Plan did include performance parameters. On January 31, 2001, the Space and Naval Warfare System Center San Diego issued a C^4I Support Plan to PMS 529 for NFCS that included the information exchange requirements, which are the basis for interoperability key performance parameters, for communication and coordination links between organization elements involved in land-attack warfare. The C^4I Support Plan discusses interfaces between land attack systems and associated C^4I systems, both onboard and external to the surface combatant, and shows three fire support roles for NFCS. In each of the three fire support roles, NFCS is involved with AFATDS, which is an Acquisition Category I program. Therefore, the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) should review and assess the interoperability and information exchange requirements in the C^4I Support Plan to resolve any interoperability issues that may arise between NFCS and AFATDS.

USS *Coronado*. The USS *Coronado* is the command and control ship for the Third Fleet and has numerous missions. One of its missions is acting as the Navy's only sea-based battle laboratory, which manages and implements Fleet battle experiments for the Commander, Third Fleet. Part of the ship's command and control functions is to provide joint fire support planning. To accomplish this task, the ship uses the Global Command and Control System-Maritime, which provides situation awareness information. The Global Command and Control System-Maritime interfaces with LAWS[17] during Fleet battle experiments to communicate fire mission planning to destroyers and cruisers for shore bombardment even though it has AFATDS. However, the land forces use AFATDS to plan and coordinate fire missions and then to relay those fire missions over voice systems to destroyers and cruisers for shore bombardment. After NFCS is operational, it will interface with AFATDS to

[16]Instruction revised to Chairman of the Joint Chiefs of Staff Instruction 3170.01B, "Requirements Generation System," April 15, 2001,

[17]LAWS is a science and technology prototype.

reduce the need for voice communication. To ensure that the Global Command and Control System-Maritime, LAWS, AFATDS, and NFCS effectively interface, the Navy needs to update the ORD to include NFCS Phase I Plus, the functionality of Phase II, and the interface fire support functionality requirements of the USS *Coronado*.

Test and Evaluation Requirements. On September 7, 1999, PMS 529 approved the TEMP, which described the NFCS in Phase I and Phase II only, and provided measures of effectiveness for testing that were based on operational requirements in the July 1, 1999, ORD. The TEMP also discussed interoperability testing based on the two phases, and specified operational milestones to demonstrate NFCS interoperability with identified systems. Consequently, the test and evaluation plans for measures of effectiveness and interoperability should be updated to include Phase I Plus requirements. The TEMP states that the Naval Surface Warfare Center, Port Hueneme, California, will be responsible for developmental test and evaluation during shipboard events. The Commander, Operational Test and Evaluation Force, will monitor all development testing, as well as planning and executing operational test and evaluation events for the NFCS. The first and second developmental tests for Phase I are scheduled for the fourth quarter, FY 2001, and the second quarter, FY 2002, respectively. The operational assessment is scheduled for the third quarter, FY 2002.[18] However, the TEMP did not include a schedule for the NFCS Phase I Plus Program. Although the TEMP discusses test resources and fire mission planning, they may not be sufficient to validate that NFCS performance exceeds the performance of the baseline associated with the current manual process.

Test Resources for Phase I and Phase I Plus. The Navy may not have sufficient test resources for Phase I and Phase I Plus. Personnel at the Office of the Commander, Operational Test and Evaluation Force, and the Naval Surface Warfare Center, Port Hueneme, indicated that test resources, such as areas to conduct live fire testing, a designated ship to host the NFCS for operational evaluation, and Marines acting as forward observers to designate targets for testing Phase I, have not been committed. However, the Navy is attempting to obtain those resources. Without those resources, cost and schedule for the NFCS, which the NFCS Program Office manages, may be affected. The Commander, Operational Test and Evaluation Force, and the Naval Surface Warfare Center, Port Hueneme, are defining and committing resources to execute the plan but, as of December 2001, could not define the cost for operationally testing the NFCS and were still deciding:

- where the operational test would be conducted,
- which operational ship the Navy would use to test the NFCS, and
- whether all NFCS requirements could be fully tested to the objectives and thresholds stated in the July 9, 1999, TEMP.

[18]Because of Fleet operational exercises, the Navy may have to conduct a combined developmental and operational test, which would also require an update to the TEMP.

Further, the Naval Surface Warfare Center, Port Hueneme, indicted that it would not fully test all NFCS requirements to their threshold limits in a ship environment, but rather at a land-based facility, because of cost and schedule constraints.

Fire Mission Planning. Before NFCS, fire mission planning consisted of a group of sailors manually calculating incoming calls for fires using a manual plotting method. The Navy envisioned that NFCS would greatly reduce the calculation time and manpower required for fire mission planning and coordination. The ORD for the NFCS neither required a comparison between the manual plotting method and the NFCS nor stated that the NFCS process be as good as or better than the manual plotting method. However, the Navy plans to use a ship that will conduct fire missions without the NFCS and then to test with the NFCS. Subjective evaluation for comparison of the two methods will be reviewed, but no formal comparison was planned. However, the TEMP did not discuss the Navy's conduct of the subjective evaluation between the manual and the automated NFCS processes, which includes procedures for tactics and techniques, to determine whether NFCS would be more efficient and effective than the manual process. Further, for an adequate operational evaluation, test scenarios must be based, at a minimum, on standard fire mission procedures to evaluate the stress and other human factors that operators may endure, and should include procedures that specify how the NFCS operators will interact and how they will be supervised during the fire missions.[19]

Effect of Operational Testing Without Current Operational Requirements and Test Plan

Without an updated ORD and TEMP that accurately show user and test and evaluation requirements for Phase I Plus and Phase II, the Navy cannot plan for the test resources that will be required to test NFCS, thus impacting the NFCS schedule and cost. Also, the Navy cannot ensure that the NFCS meets the minimum required system capabilities and characteristics that are considered essential for successful mission accomplishment. By updating the ORD and the TEMP, the Navy developmental and operational testers will be able to test the NFCS to:

- determine whether NFCS meets the user's needs, including interoperability key performance parameters derived from information exchange requirements;
- identify schedule and resource constraints that will affect the program schedule and test management strategy and structure;
- identify the resources required to evaluate critical operational issues, objectives, and thresholds documented in the updated ORD; and

[19]The Navy was developing a tactical memorandum to define fire mission procedures for tactics and techniques.

- provide operational test data to the milestone decision authority to assess the readiness of each NFCS phase to enter full-rate production.

If the Navy updates and approves the ORD and the TEMP, it can lessen the NFCS risk of increasing testing cost and delaying schedule and improve the test and evaluation process to fully test and evaluate all program requirements, including key performance parameters, as discussed in the C^4I Support Plan. In August 2001, the NFCS Program Office stated that it would not conduct formal operational evaluation of NFCS without a revised ORD and an updated TEMP and test plan. Further, the NFCS Program Office stated that it was coordinating testing of the NFCS with the Commander, Operational Test and Evaluation Force.

Management Comments on the Finding and Audit Responses

Summaries of management comments on the finding and our responses are in Appendix D.

Recommendations, Management Comments, and Audit Responses

C.1. We recommend that the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) update the operational requirements document for the Naval Fires Control System to include Phase I Plus, the functionality of Phase II, and the interface fire support functionality requirements of the USS *Coronado* (AGF-11).

Management Comments. The Deputy Assistant Secretary of the Navy, Ship Programs, Office of the Assistant Secretary of Navy (Research, Development, and Acquisition), concurred, stating that the Surface Warfare Division, Office of the Deputy Chief of Naval Operations (Naval Warfare), is updating the ORD for the NFCS to include the development of NFCS Phase II requirements, evolving Marine Corps doctrine, and improved Naval surface-fire support capabilities. However, the Deputy stated that further definition of NFCS Phase I Plus requirements may not be required because of potential changes in the Land Attack Missile program. The Deputy also stated that the revised requirements will include feedback from Fleet battle experiments aboard the USS *Coronado* and recommendations from Fleet operators. For the complete text of the Deputy's comments, see the Management Comments section of this report.

C.2. We recommend that the Program Manager, Naval Surface Fire Support (PMS 529), update the test and evaluation master plan for the Naval Fires Control System to include the updated operational requirements for Phase I Plus and requirements for sufficient testing resources and fire mission planning.

Management Comments. The Deputy Assistant Secretary of the Navy, Ship Programs, concurred, stating that the TEMP for the NFCS will be updated to conform with final updates to the ORD for the NFCS. Further, the Deputy stated that the TEMP and ORD updates will be done in parallel.

C.3. We recommend that the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) review the Command, Control, Communications, Computers, and Intelligence Support Plan for the Naval Fires Control System to assess the interoperability and information exchange requirement issues for all phases of the program.

Acting Director, Program Analysis and Integration, Office of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), Comments. The Acting Director concurred, stating that the C^4I Support Plan review process requires that an ORD, including interoperability key performance parameters, be completed and submitted to the Director for Command, Control, Communications, and Computers (J-6), Office of the Joint Staff, for review before submission of the C^4I Support Plan for review. Further, the Acting Director stated that the NFCS Program Office estimates that the C^4I Support Plan will be ready for review in May 2002. The Acting Director also stated that the complete C^4I Support Plan review process would take approximately 6 months and that his office will provide us with the results of the review. For the complete text of the Acting Director's comments, see the Management Comments section of this report.

Chief, Command, Control, Communications, and Computers Requirements and Assessment Division, Office of the Director for Command, Control, Communications, and Computers (J-6), Comments. Although not required to comment, the Chief agreed with the recommendation and stated that J-6 should be included in the assessment of the C^4I Support Plan for the NFCS, in accordance with Chairman of the Joint Chiefs of Staff Instruction 6212.01B. For the complete text of the Chief's comments, see the Management Comments section of this report.

C.4. We recommend that, upon the receipt of the updated operational requirements document for the Naval Fires Control System, the Director for Command, Control, Communications, and Computers (J-6) review and certify, as appropriate, the document for interoperability and coordinate it in accordance with Chairman of the Joint Chiefs of Staff Instruction 6212.01B, "Interoperability and Supportability of National Security Systems, and Information Technology Systems," May 8, 2000.

Management Comments. The Chief, Command, Control, Communications, and Computers Requirements and Assessment Division, concurred, stating that the correct title of Chairman of the Joint Chiefs of Staff Instruction 6212.01B is "Interoperability and Supportability of National Security Systems, and Information Technology Systems."

Audit Response. We revised the report accordingly.

Appendix A. Audit Process

Scope and Methodology

We reviewed documentation dated from May 1992 through August 2001. We interviewed and obtained documentation from the staffs of the Office of the Joint Chiefs of Staff; the Office of the Chief of Naval Operations; the Commander, Third Fleet; the Commander, Naval Sea Systems Command; the Commander, Marine Corps Combat Development Command; the Commander, Space and Naval Warfare Systems Command; the Director, Defense Information Systems Agency; the Commander, Joint Interoperability and Engineering Organization; the Program Executive Officer for Surface Strike; the Program Manager, Naval Surface Fire Support (PMS 529); the Project Manager, Army Field Artillery Tactical Data Systems; and the Project Manager, Naval Fires Control System. Because the NFCS Program was in the engineering and manufacturing development phase, the audit concentrated on whether management was cost-effectively readying the system for the production phase of the acquisition process. Consequently, we focused our review on the areas of program definition, structure, design, assessments and decision reviews, and periodic reporting.

Audit Type, Dates, and Standards. We performed this program audit from January through September 2001 in accordance with generally accepted government auditing standards.

Use of Computer-Processed Data. We did not rely on computer-processed data to perform this audit.

Use of Technical Assistance. A computer engineer from the Technical Assessment Division, Office of the Assistant Inspector General for Auditing, DoD, assisted the auditors in evaluating software requirements for the NFCS.

Contacts During the Audit. We visited or contacted individuals and organizations within DoD; General Dynamics Information Systems, Arlington, Virginia; and Raytheon Systems Company, Fort Wayne, Indiana. Further details are available on request.

General Accounting Office High-Risk Area. The General Accounting Office has identified several high-risk areas in the DoD. This report provides coverage of the DoD Weapon Systems Acquisition high-risk area.

Management Control Program Review

DoD Directive 5010.38, "Management Control (MC) Program," August 26, 1996, and DoD Instruction 5010.40, "Management Control (MC) Program Procedures," August 28, 1996, require DoD organizations to implement a

comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of the controls.

Scope of the Review of the Management Control Program. In accordance with DoD Regulation 5000.2-R, acquisition managers are to use program cost, schedule, and performance parameters as control objectives to implement the requirements of DoD Directive 5010.38. Accordingly, we limited our review to management controls directly related to program definition, structure, design, assessments and decision reviews, and periodic reporting.

Adequacy of Management Controls. The management controls over the acquisition of the NFCS were adequate in that we did not identify any material management control weakness.

Prior Coverage

During the last 5 years, the General Accounting Agency issued two reports addressing the NFCS.

Report No. GAO-01-493, "Navy Acquisitions: Improved Littoral War-Fighting Capabilities Needed," May 18, 2001

Report No. NSIAD-99-91, "Defense Acquisitions: Naval Surface Fire Support Program Plans and Costs," June 11, 1999

Appendix B. Definitions of Technical Terms

Acquisition Category. An acquisition category is an attribute of an acquisition program that determines the program's level of review, decision authority, and applicable procedures. The acquisition categories consist of I, major Defense acquisition programs; IA, major automated information systems; II, major systems; and III, all other acquisition programs. Acquisition Category I programs have two sub-categories: ID and IC. Acquisition IA programs also have two sub-categories: IAM and IAC.

Acquisition Plan. An acquisition plan is a formal written document showing the specific actions necessary to implement the approach established in the approved acquisition strategy.

Acquisition Strategy. An acquisition strategy is a business and technical management approach designed to achieve program objectives within the resource constraints imposed. It is the framework for planning, directing, contracting for, and managing a program. It provides a master schedule for research, development, test, production, fielding, modification, postproduction management, and other activities essential for program success. The acquisition strategy is the basis for formulating functional plans and strategies.

Baseline. A baseline is a defined quantity or quality used as starting point for subsequent efforts and progress measurement that can be a technical, cost, or schedule baseline.

Capstone Requirements Document. A capstone requirements document is a document that contains capabilities-based requirements to develop individual operational requirements documents by providing a common framework and operational concept to guide their development. The capstone requirements document is also an oversight tool for overarching requirements for a system-of-systems or family-of-systems.

Capstone Test and Evaluation Master Plan. A capstone test and evaluation master plan is a test and evaluation master plan that addresses the testing and evaluation of a Defense system consisting of a collection of individual systems which function collectively to achieve the objectives of the Defense system. Individual system-unique content requirements are addressed in an annex to the basic capstone test and evaluation master plan.

Command, Control, Communications, Computers, and Intelligence (C^4I) Support Plan. A C^4I support plan describes system dependencies and interfaces in sufficient detail to enable planning for interoperability key performance parameters derived from information exchange requirements.

Command, Control, Communications, Computers, and Intelligence Surveillance and Reconnaissance (C^4ISR) Architecture Framework. The C^4ISR architecture framework provides rules, guidance and product descriptions

for developing and presenting different architectural views of a given system to ensure a common denominator for understanding, comparing and integrating architectures across DoD.

Critical Operational Issue. A critical operational issue is a key operational effectiveness issue or operational suitability issue, or both, that must be examined in the operational test and evaluation to determine the system's capability to perform its mission.

Earned Value Management. Earned value management is a tool that allows both government and contractor program managers to have visibility into technical, cost, and schedule progress on their contracts. The implementation of an earned value management system is a recognized function of program management. It ensures that cost, schedule and technical aspects of the contract are truly integrated.

Fire Control System. A Fire Control System is the group of interrelated fire control equipment and instruments designed for use with a weapon or group of weapons that control all operations in connection with the application of fire on a target.

Fire Support. Fire support is weapon fires that directly support land, maritime, amphibious, and special operation forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives.

Fire Support Coordination Center. The Fire Support Coordination Center is a single location in which are centralized communications facilities and personnel incident to the coordination of all forms of fire support.

Follow-On Operational Test and Evaluation. Follow-on operational test and evaluation is test and evaluation that may be necessary after the full-rate production decision to refine the estimates made during operational test and evaluation to evaluate changes and to reevaluate the system to ensure that it continues to meet operational needs and retains its effectiveness in a new environment or against a new threat.

Information Exchange Requirements. Information exchange requirements characterize the information exchanges to be performed by a proposed system and identify who exchanges what information with whom as well as why the information is necessary and how the users will employ that information.

Interoperability. Interoperability is the ability of systems, units, or forces to provide services to or accept services from other systems, units, or forces and to use the services so exchanged to operate effectively together.

Joint Technical Architecture. Joint technical architecture is a common set of mandatory information technology standards, which are primarily interface standards, and guidelines to be used by all emerging systems and systems upgrades including Advanced Concept Technology Demonstrations. Joint

technical architecture can be used to establish a system's technical architecture, and is applicable to all C^4I and automated information systems and the interfaces of other key assets, such as weapons systems, and sensors, with C^4I systems.

Key Performance Parameters. Key performance parameters are capabilities or characteristics so significant that failure to meet the threshold or minimum acceptable value can be cause for the concept or system selected to be reevaluated or the program to be reassessed or terminated.

Life-Cycle Cost. Life-cycle cost is the total cost to the government of acquisition and ownership of that system over its useful life. In includes the cost of development, acquisition, operating, support, and, where applicable, disposal.

Measure of Effectiveness. A measure of effectiveness is the quantitative expression defined to measure operational capabilities in terms of engagement or battle outcomes.

Mission Needs Statement. The mission needs statement is a formatted non-system specific statement containing operational capability needs and written in broad operational terms and describes required operational capabilities and constraints to be studied.

Operating and Support Costs. Operating and support costs consist of those resources required to operate and support a system, subsystem, or a major component during its useful life in the operational inventory.

Operational Requirements Document. The ORD shows the users objectives and minimum acceptable requirements for operational performance of a proposed concept or system.

Pre-Planned Product Improvement. A pre-planned product improvement includes improvements planned for ongoing systems that go beyond the current performance envelope to achieve a needed operational capability.

Program. A program is an acquisition effort funded by research, development, test and evaluation or procurement appropriations, or both, with the express objective of providing a new or improved capability in response to a stated mission need or deficiency.

Software Requirements Specification. A software requirements specification documents the essential requirements, including functions, performance, design constraints and attributes, of a given software item.

Software Reuse. Software reuse is a the process of implementing or updating software systems using existing software assets.

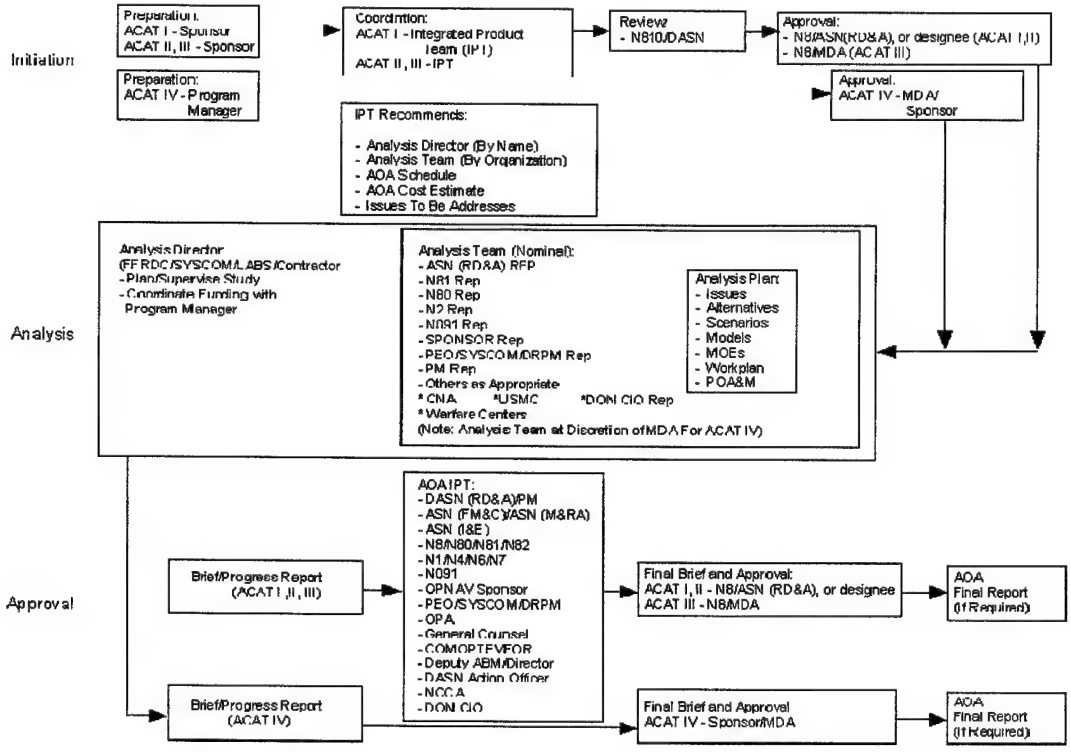
Supporting Arms Coordination Center. A Supporting Arms Coordination Center (the Center) is a single location on board an amphibious command ship

in which all communication facilities to coordinate fire support of the artillery, air, and Naval gunfire are centralized. The Center is the Naval counterpart to the fire support coordination center utilized by the landing force.

Test and Evaluation Master Plan. The TEMP documents the overall structure and objectives of the test and evaluation program. It provides a framework within which to generate detailed test and evaluation plans and it documents schedule and resource implications associated with the test and evaluation program. The TEMP identifies the necessary developmental test and evaluation, operational test and evaluation, and live fire test and evaluation activities. Further, the TEMP relates program schedule, test management strategy and structure, and required resources to critical operational issues; critical technical parameters; objectives and thresholds documented in the ORD; evaluation criteria; and milestone decision points.

Appendix C. Navy Analysis of Alternatives Initiation, Analysis, and Approval Process

The following is a flow chart of the analysis of alternatives process as discussed in the Secretary of the Navy Instruction 5000.2B, "Implementation of Mandatory Procedures for Major and Non-Major Defense Acquisition Programs and Major and Non-Major Information Technology Acquisition Programs," December 6, 1996.



See next page for definitions of the acronyms used in the flow chart.

Acronyms

ABM	Acquisition and Business Management
ACAT	Acquisition Category
AOA	Analysis of Alternatives
ASN (FM&C)	Assistant Secretary of the Navy (Financial Management and Comptroller)
ASN (I&E)	Assistant Secretary of the Navy (Installations and Environment)
ASN (M&RA)	Assistant Secretary of the Navy (Manpower and Reserve Affairs)
ASN (RD&A)	Assistant Secretary of the Navy (Research, Development and Acquisition)
CNA	Center for Naval Analyses
COMOPTEVFOR	Commander, Operational Test and Evaluation Force
DASN	Deputy Assistant Secretary of the Navy
DON CIO	Department of the Navy Chef Information Officer (US Navy)
DRPM	Directing Reporting Program Manager
FFRDC/SYSCOM/ LABS/Contractor	Federally Funded Research and Development Center/Systems Command/Labs/Contractor
IPT	Integrated Product Team
MDA	Milestone Decision Authority
MOEs	Measures of Effectiveness
N091	Director of Navy Test and Evaluation and Technology Requirements
N1	Deputy Chief of Naval Operations (Manpower and Personnel)
N4	Deputy Chief of Naval Operations (Naval Logistics)
N6	Director, Space Information Warfare Command and Control
N7	Deputy Chief of Naval Operations (Naval Warfare)
N2	Director of Naval Intelligence
N8	Deputy Chief of Naval Operations
N80	Director Programming Division
N81	Assessment Division
N82	Director of Fiscal Management Division
N8/ASN(RD&A)	Deputy Chief of Naval Operations/Assistant Secretary of the Navy (Research, Development and Acquisition)
N8/MDA	Deputy Chief of Naval Operations/Milestone Decision Authority
N810/DASN	Head Requirements and Acquisition Branch/ Deputy Assistant Secretary of the Navy
NCCA	Naval Center for Cost Analysis (US Navy)
OPA	Office of Public Affairs
OPNAV	Office of the Chief of Naval Operations
PEO/SYSCOM/ DRPM	Program Executive Office/Systems Command/ Direct Reporting Program Manager
PM	Program Manager
POA&M	Plan of Action and Milestones
REP	Representative
SYSCOM	Systems Command
USMC	United States Marine Corps

Appendix D. Audit Responses to Navy Comments Concerning the Report

Our detailed responses to the comments from the Deputy Assistant Secretary of the Navy, Ship Programs, Office of the Assistant Secretary of Navy (Research, Development, and Acquisition), on statements in the draft report follow. The complete text of those comments is in the Management Comments section of this report.

Management Comments on Finding A and Audit Response

Management Comments Addressing Specific Statements in the Finding. The Deputy commented on the NFCS Program Office efforts to develop and acquire NFCS Phase II, the ability of AFATDS to meet the ORD requirements, the introduction of multiple programming languages, the existing and planned system functionality of AFATDS on amphibious ships, and the NFCS Phase II effort for cruisers and destroyers.

Efforts to Develop and Acquire NFCS Phase II. The Deputy stated that the report inaccurately states that NFCS Phase II requirements duplicate AFATDS functionality. Further, the Deputy stated that AFATDS has significant supporting command and control functionality for future NFCS Phase II efforts, which can and should be considered for reuse in NFCS Phase II.

Audit Response. The AoA, conducted by the Center for Naval Analyses, concluded that AFATDS met 100 percent of the ORD requirements for Phase II. By developing and acquiring the NFCS Phase II that duplicates the existing and planned functionality of the AFATDS, the Navy is wasting funds.

ORD Requirements. The Deputy recommended that the bullet in the software reuse paragraph of the report, which states that "AFATDS fully or mostly met 100 percent of the ORD requirements, as discussed in the March 25, 1999, AoA," should be revised to read, "AFATDS fully or mostly supports 100% [percent] of the NFCS ORD Phase II requirements with the exception of critical gun and missile fire control interfaces." The Deputy stated that Footnote 13 in the report makes his proposed revision; however, he believes that the footnote should be associated with the software reuse paragraph in the report.

Audit Response. The bullet is supported by the conclusions of the AoA conducted by the Center for Naval Analyses. Further, the AoA did not address the exception noted by the Deputy. We revised the report so that the footnote is associated with the software reuse paragraph.

Multiple Programming Languages. The Deputy recommended that the report statement concerning the introduction of multiple programming languages associated with the interface of NFCS with AFATDS and other command and

control systems be deleted because the statement appears to confuse mixed programming languages within a given system with multiple programming languages among different systems.

Audit Response. If two or more systems must interface with each other, the associated programming languages must also interface for those systems to be interoperable and to operate effectively together.

System Functionality. The Deputy stated that Navy fire control operators will operate NFCS Phase II on cruisers and destroyers, and that the Marines, the sailors, or both, will operate a fires coordination element on amphibious ships. Further, the Deputy stated that system operator determination, system complexity, current technology, ease of operation, and required training for system development must be addressed when considering the development strategy for NFCS Phase II. The Deputy also stated that ensuring that efforts to develop and acquire the NFCS Phase II did not duplicate the existing and planned functionality of the AFATDS on amphibious ships was not a simple matter of system functionality.

Audit Response. Whether NFCS or AFATDS is used to meet the Phase II functionality requirements, the Navy must address system operator determination, system complexity, current technology, ease of operation, and required training for system development when considering the development strategy for either system.

NFCS Phase II Effort for Cruisers and Destroyers. The Deputy recommended that the report paragraph addressing a strategy for the NFCS Phase II on cruisers and destroyers add the following statement, "The NFCS Phase II effort for CRUDES [cruisers and destroyers] will consider software reuse of AFATDS functionality built on the NFCS Phase I product to meet NFCS Phase II requirements." The Deputy stated that the Amphibious Navy may consider reusing AFATDS for the fire coordination element capability requirement without the need for gun and missile weapon control interfaces essential to the cruisers and destroyers NFCS Phase I and Phase I Plus development effort. The Deputy concluded that rebuilding the gun and missile weapons control interfaces to function with AFATDS for the cruisers and destroyers' NFCS Phase II effort would be impractical.

Audit Response. We revised the report to include the additional statement. The report is not suggesting that rebuilding the gun and missile weapons control interfaces to function with AFATDS for the cruisers and destroyers; however, NFCS should be interoperable with AFATDS on the cruisers and destroyers for fire-support command, control, and communications.

Management Comments on Finding B and Audit Response

Management Comments Addressing Specific Statements in the Finding. The Deputy commented that the EVMS requirements are based on contract value. Further, the Deputy stated that the NFCS contract employs EVMS; however, the size of the contract does not warrant expenditures required to

maintain a full-up certified EVMS. The Deputy also stated that the EVMS reporting for NFCS is tailored and is reported monthly, and that contractor cost performance is satisfactory.

Audit Response. If EVMS guidelines are applied to a contract, DoD Regulation 5000.2-R requires that, unless waived by the milestone decision authority, the program manager will require that contractor's management information systems used in planning and controlling contract performance meet the EVMS guidelines in the American National Standards Institute (ANSI)/EIA Standard for Earned Value Management Systems (ANSI/EIA-748-98), approved May 19, 1998. Without a certified EVMS, the Navy cannot ensure that the contractor's EVMS is producing data that accurately indicate work progress; properly relate cost, schedule, and technical accomplishments; and are valid, timely, and auditable.

Management Comments on Finding C and Audit Response

Management Comments Addressing Specific Statements in the Finding. The Deputy commented on ORDs and succeeding TEMPs for the NFCS; the common fire-support ORD; the Director for Command, Control, Communications, and Computers (J-6) certification of the ORD; the use of the Land Attack Warfare System (LAWS); conducting NFCS operational tests, and the lack of a requirement to conduct a comparative test between manual versus automated NFCS processes.

ORDs and Succeeding TEMPs. The Deputy stated that the Navy updates ORDs and succeeding TEMPs before program acquisition milestones. Further, the Deputy stated that the addition of the NFCS Phase I Plus will be addressed in a revised ORD and TEMP in time for a follow-on operational test and evaluation for NFCS Phase I Plus in February 2004.

Common Fire-Support ORD. The Deputy stated that the common fire support ORD is the ORD for the NFCS and that subsequent updates for fire support command and control should be included in future ORD revisions for the NFCS. Further, the Deputy stated that the USS *Coronado* is a sea-based test bed that the Navy has used for concept exploration and risk reduction for the Commander, Third Fleet. The Deputy also stated that the Program Manager, Naval Surface Fire Support (PMS 529), has actively participated in Fleet battle experiments since 1997.

J-6 Certification. The Deputy stated that J-6 reviewed the original ORD for the NFCS and that the Navy will notify J-6 when the revised ORD is ready for certification review.

LAWS. The Deputy recommended that the report paragraph not address LAWS as part of the interface fire support functionality requirements of the USS *Coronado* when the Navy updates the ORD for NFCS. The Deputy stated that the Program Manager, Naval Surface Fire Support (PMS 529), uses LAWS as a prototype for Navy Fleet battle experimentation and that NFCS is the

documented, configuration-managed program of record sponsored by the Surface Warfare Division, Office of the Deputy Chief of Naval Operations (Naval Warfare).

Audit Response. The NFCS fielding plan does not include NFCS on command ships, such as the USS *Coronado* or aircraft carriers, for fire support. For joint fire support planning, the USS *Coronado* uses the Global Command and Control System-Maritime, which interfaces with LAWS, to communicate fire mission planning to destroyers and cruisers for shore bombardment even though it has AFATDS. If the USS *Coronado* continues to use LAWS, rather than AFATDS, as part of its fire mission planning, the Navy needs to include LAWS in its update to the ORD for NFCS to ensure that the Global Command and Control System-Maritime, LAWS, AFATDS, and NFCS effectively interface to provide expedient joint fire support planning to the warfighter.

NFCS Operational Tests. The Deputy stated that the Navy will probably conduct NFCS operational tests at San Clemente using West Coast ships and that the NFCS test community is participating in scheduling conferences.

Comparative Testing. The Deputy stated that a requirement does not exist to conduct a comparative test between the manual and the automated NFCS processes. Further, the Deputy stated that the Commander, Operational Test and Evaluation Force, would decide whether to require such a test to validate NFCS efficiency.

Audit Response. The ORD for the NFCS neither required a comparison between the manual plotting method and the NFCS nor stated that the NFCS process be as good as or better than the manual plotting method. By not formally comparing the two processes, the Navy cannot ensure that all required functions of the manual plotting method have been incorporated into the NFCS process to support the warfighter.

Appendix E. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition, Technology, and Logistics
Under Secretary of Defense (Comptroller)
  Deputy Chief Financial Officer
  Deputy Comptroller (Program/Budget)
Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)
Director, Operational Test and Evaluation

Joint Staff

Director, Joint Staff
  Director for Command, Control, Communications, and Computers

Department of the Army

Assistant Secretary of the Army (Acquisition, Logistics, and Technology)
  Program Executive Officer, Command, Control, and Communications Systems
    Project Manager, Field Artillery Tactical Data Systems
Auditor General, Department of the Army

Department of the Navy

Assistant Secretary of the Navy (Financial Management and Comptroller)
Assistant Secretary of the Navy (Research, Development, and Acquisition)
  Program Executive Officer for Surface Strike
    Program Manager, Naval Surface Fire Support (PMS 529)
      Project Manager, Naval Fires Control System
Naval Inspector General
Commander, Naval Sea Systems Command
  Commander, Naval Surface Warfare Center, Dahlgren
  Commander, Naval Surface Warfare Center, Port Hueneme
Deputy Chief of Naval Operations (Naval Warfare)
Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments)
Auditor General, Department of the Navy
Commander, Marine Corps Combat Development Command
Commander, Navy Warfare Development Command
Commander, Space and Naval Warfare Systems Command
Commander, Operational Test and Evaluation Force
Director, Naval Center for Cost Analysis

Department of the Air Force

Assistant Secretary of the Air Force (Financial Management and Comptroller)
Auditor General, Department of the Air Force

Unified Command

Commander In Chief, Pacific
  Commander In Chief, Pacific Fleet
    Commander, Third Fleet

Other Defense Organizations

Director, Defense Contract Management Agency
Director, Defense Information Systems Agency
  Commander, Joint Interoperability and Engineering Organization

Non-Defense Federal Organization

Office of Management and Budget

Congressional Committees and Subcommittees, Chairman and Ranking Minority Member

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
House Committee on Armed Services
House Committee on Government Reform
House Subcommittee on Government Efficiency, Financial Management, and Intergovernmental Relations, Committee on Government Reform
House Subcommittee on National Security, Veterans Affairs, and International Relations, Committee on Government Reform
House Subcommittee on Technology and Procurement Policy, Committee on Government Reform

This page was left out of original document

Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) Comments

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

15 NOV 2001

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE

SUBJECT: Audit Report on the Acquisition of the Naval Fires Control System (NFCS) (Project No. D2001 AE-0069)

This is in response to the Inspector General, Department of Defense memorandum, September 19, 2001 concerning the IG DoD report noted at subject, which requested that the Assistant Secretary of Defense(Command, Control, Communications and Intelligence) comment on report recommendation C.3.

Recommendation C.3 (page 22 of the report) states: "We recommend that the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) review the Command, Control, Communications and Intelligence Support Plan for the Navy Fires Control System to assess interoperability and information exchange requirements for all phases of the program."

We concur with comment. The C4I Support Plan review process requires that an Operational Requirements Document (ORD) including Interoperability Key Performance Parameter (IKPP) be completed and submitted to the Joint Staff (J-6) for review prior to submission of the programs C4I Support Plan for review. The subject report indicated that the NFCS ORD is in need of revision. The NFCS program office estimates that the C4ISP will be ready for review in May 2002. The complete C4ISP review process takes approximately 6 months.

The Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) will provide the IG DOD with the results of the NFCS C4I Support Plan upon completion of the review.

Our Point of Contact for this matter is Mr. Roger Thorstenson at 703-607-0670.

Mr. Joe Callier
Director (Acting)
Program Analysis and Integration

Joint Staff Comments

THE JOINT STAFF
WASHINGTON, DC

Reply ZIP Code:
20318-6000

December 10, 2001

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE

SUBJECT: Audit Report on the Acquisition of the Naval Fires Control System (Project No. D2001AE-0069)

1. In accordance with the Department of Defense Directive Number 7650.3, the Joint Staff J6 Requirements and Assessments Division (J6E) reviewed the Audit Report on the Acquisition of the Naval Fires Control System. Based on the review, we concur with comment to the following recommendations:

Recommendation C.3: We recommend that the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) review the Command, Control, Communications, Computers, and Intelligence Support Plan (C4ISP) for the Naval Fires Control System to assess the interoperability and information exchange requirement issues for all phases of the program.

J6E Comment: In accordance with CJCSI 6212.01B, Enclosure D, include the Joint Staff J6 as an assessor of the Naval Fires Control System C4ISP.

Recommendation C.4: Upon receipt of the updated operational requirements document for the Naval Fires Control System, the Director for Command, Control, Communications, and Computers (J6) review and certify, as appropriate, the document for interoperability and coordinate it in accordance with Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6212.01B, "Compatibility, Interoperability, Integration, and Supportability of Command Control, Communications, Computers, Intelligence and Weapon Systems."

J6E Comment: The correct title of CJCSI 6212.01B is "Interoperability and Supportability of National Security Systems and Information Technology Systems."

2. For coordination, contact LTC Darryl Dean, (703) 614-6713/DSN: 224-6713, or MAJ Cedric Rice, (703) 614-5290/DSN: 224-5290.

H. A. LINCOLN, JR.
CAPT, USN
Chief, C4 Requirements and Assessment Division, J6E

Department of the Navy Comments

DEPARTMENT OF THE NAVY
OFFICE OF THE ASSISTANT SECRETARY
RESEARCH, DEVELOPMENT AND ACQUISITION
1000 NAVY PENTAGON
WASHINGTON DC 20350-1000

DEC 0 6 2001

MEMORANDUM FOR THE INSPECTOR GENERAL, DEPARTMENT OF THE NAVY

Subj: DRAFT DODIG AUDIT REPORT ON ACQUISITION OF THE NAVAL FIRES CONTROL SYSTEM (PROJECT NO. D2001AE-0069)

Ref: (a) DODIG Memo of 19 September 2001

Encl: (1) DON Response to DODIG Draft Report, Project No. D2001AE-0069

1. I am responding to the draft audit report forwarded by reference (a).

2. The Department of the Navy (DON) response is enclosure (1). In general, DON concurs with the intent of Recommendations A1-A3, C1, and C2, and will work toward implementing corrective actions, as appropriate.

3. We note, however, that existing review and validation systems meet the requirements for ACAT III program contract value. As such, no action is considered necessary for Recommendations B.1 and B.2.

4. The DASN(SHIPS) point of contact is CDR Stephen Lewia, (703)614-4495.

M. B. Waldman
Deputy Assistant Secretary of the Navy, Ship Programs

Copy to:
COMNAVSEA (SEA 00N3)
OPNAV (N76)
NCCA (NCCA-2)

DEPARTMENT OF THE NAVY RESPONSE
TO
DODIG DRAFT REPORT ON ACQUISITION OF THE NAVAL FIRES CONTROL SYSTEM
(Project No. D2001AF-0069, Dated 19 Feb 2001)

1. Responses to the 7 Recommendations outlined in the referenced DODIG Draft report are provided as follows:

Recommendation A1: We recommend that the Director, Naval Center for Cost Analysis, conduct a life cycle cost comparison between the Army Advanced Field Artillery Tactical Data System and the Naval Fires Control System to determine which system most cost-effectively meets the requirements in the operational requirements document for the Naval Fires Control System Phase II and provide the results to the Deputy Chief of Naval Operations (Naval Warfare) and the Program Manager, Naval Fires Control System (PMS529).

DON Response: Concur with intent. We understand that AFATDS is in the process of being upgraded to make the code more transportable. OPNAV is in the process of updating the NFCS Operational Requirements Document (ORD) and will re-evaluate the updated AFATDS against NFCS Phase II requirements. If it is determined that the updated AFATDS is a viable alternative for NFCS, a life cycle cost analysis would be appropriate.

Recommendation A.2: We recommend that the Deputy Chief of Naval Operations (Naval Warfare) determine whether Phase II of the Naval Fires Control System meets Naval doctrine to project Naval power ashore in support of the Marine Corps, whether it duplicates existing Army Advanced Field Artillery Tactical Data System functionality, and whether it should continue to be funded by the Navy.

DON Response: Concur with intent. OPNAV has concluded that NFCS Phase II meets the Naval doctrine requirements for fire support in support of ground forces ashore. During NFCS Phase I program selection, AFATDS was not chosen as the optimum solution for the following reasons: opportunity for software reuse was limited; use of Ada programming language made program manipulation difficult; and the life-cycle cost of AFATDS was nearly double that of NFCS. Since that time, we understand that AFATDS is in the process of being upgraded to make the code more

transportable. OPNAV is in the process of updating the ORD and will re-evaluate AFATDS against NFCS Phase II requirements. The Navy must continue to fund the NFCS Phase II functionality in order to support the Marine Corps' evolving expeditionary maneuver concepts.

Recommendation A.3: We recommend that the Program Manager, Naval Fires Control System (PMS 529), update the acquisition strategy to incorporate Phase I Plus of the Naval Fires Control System and update the acquisition plan with the results of the Deputy Chief of Naval Operations (Naval Warfare) review and Director, Naval Center for Cost Analysis, life-cycle cost comparison.

DON Response: Concur. Further definition of NFCS Phase I Plus requirements may not be required due to potential changes in the Land Attack Missile program. The acquisition strategy and acquisition plan will be updated to include Phase I Plus of the Naval Fires Control System (NFCS) if required. The acquisition strategy and acquisition plan will be further updated for future program phases prior to Phase II E&MD inception. The Cruiser-Destroyer ships will continue to employ an NFCS based solution and will consider reusable AFATDS software segments, if available for NFCS Phase II. The Expeditionary Warfare Life Cycle Support Program Manager is pursuing an acquisition strategy and plan to fulfill the Fires Coordination Element Required Capabilities, as outlined in paragraph 4.c of the NFCS ORD.

Recommendation B.1 & B.2: We recommend that the Program Manager, Naval Fires Control System (PMS 529):

1. Request that the Defense Contract Management Agency conduct a certification review of the earned value management system for the Naval Fires Control System.

2. Conduct periodic reviews of the earned value management system for the Naval Fires Control System to validate contractor cost and schedule performance data.

DON Response: Do not concur. The NFCS Phase I plus contract ends in April 2002. At this point, a certification review would not be an efficient use of program resources. The existing system provides satisfactory, tailored earned value management system (EVMS) data and is in accordance with DOD Directive 5000.2

requirements for an ACAT III program contract value. No further action is required.

Recommendation C.1: We recommend that the Deputy Chief of Naval operations (Resources, Warfare Requirements, and Assessments) update the operational requirements document for the Naval Fires Control System to include Phase I Plus, the functionality of Phase II, and the interface fire support functionality requirements of the USS Coronado (AGF-11).

DON Response: Concur. DCNO (N76) is in the process of updating the ORD (IAW CJCS 3170.01B) to include the development of NFCS Phase II requirements. However, further definition of NFCS Phase I Plus requirements may not be required due to potential changes in the Land Attack Missile program. The revised requirements will include feedback from Fleet Battle Experiments aboard USS CORONADO and fleet operator recommendations. The ORD update will also include evolving Marine Corps doctrine and improved NSFS capabilities.

Recommendation C.2: We recommend that the Program Manager, Naval Surface Fire Support (PMS 529), update the test and evaluation master plan for the NFCS to include the updated operational requirements for NFCS Phase I Plus and requirements for sufficient testing resources and fire mission planning.

DON Response: Concur. Further definition of NFCS Phase I Plus requirements may not be required due to potential changes in the Land Attack Missile program. However, the Test and Evaluation Master Plan (TEMP) for NFCS will be updated in accordance with final updates to the NFCS ORD. Both TEMP and ORD updates will be done in parallel.

2. The following comments are keyed to specific finding of facts, assessments and conclusions contained in the draft report:

DODIG. (Page 3, paragraph 1 and page 5, paragraph 4) "...the NFCS Program Office efforts to develop and acquire NFCS Phase II duplicated the existing and planned functionality of the AFATDS..."

Final Report Reference

Comments: The statement that NFCS Phase II requirements duplicate AFATDS functionality is inaccurate. There is significant supporting C^2 functionality available in AFATDS for future NFCS Phase II efforts. This functionality can and should be considered for reuse in NFCS Phase II.

Page 6, Revised

DODIG. (Page 6, paragraph 3)

- "AFATDS fully or mostly met 100 percent of the ORD requirements, as discussed in the March 25, 1999, AOA; and..."

Comments: Recommend change bullet to read:

- AFATDS fully or mostly supports 100% of the NFCS ORD Phase II requirements with the exception of critical gun and missile fire control interfaces."

Note: At Footnote 13, the above statement is made, however, the footnote should initially be associated with the software reuse paragraph.

Page 7

DODIG: (Page 7, paragraph 3) "Because the ORD requires that NFCS interface with AFATDS and other command and control systems, the Navy has already introduced multiple programming languages associated with those systems."

Comments: Recommend that this statement be deleted because it appears to confuse mixed programming languages within a given system with multiple programming languages amongst different systems.

Page 10

DODIG: (Page 10, paragraph 4) "By not ensuring that efforts to develop and acquire the NFCS Phase II did not duplicate the existing and planned functionality of the AFATDS on amphibious ships, the Navy,..."

Comments: Navy fire control operators will operate NFCS Phase II on CRUDES and, the Marines and/or Sailors will operate a Fires Coordination Element (FCE) on amphibious ships. In considering the development strategy of NFCS Phase II, one must address who will operate the system, system complexity, current technology, ease of operation, and the required training for the system being developed. It is not a simple matter of system functionality.

Page 11, Revised

DODIG. (Page 11, paragraph 2)

Final Report Reference

Comments. Recommend add the following: The NFCS Phase II effort for CRUDES will consider software reuse of AFATDS functionality built on the NFCS Phase I product to meet NFCS Phase II requirements. Page 11, Revised

The Amphibious Navy may consider reusing the AFATDS product for Fires Coordination Element (FCE) required capability without the need for gun and missile weapon control interfaces intrinsic to the CRUDES NFCS Phase I/I Plus development effort. Therefore, it would be impractical to rebuild gun and missile weapons control interfaces to the AFATDS product for the CRUDES NFCS Phase II effort.

3. The following are additional comments on the assessments and conclusions contained in Findings B and C in the draft report:

Comments: (Page 13, paragraph 2) The EVMS requirements are based principally on contract value. The NFCS contract employs EVMS, but the size of the contract does not warrant expenditures required to maintain a full-up certified EVMS system. NFCS EVMS reporting is tailored and is reported monthly. Contractor cost performance is satisfactory. Page 14

Comments: (Page 16, paragraph C) ORDS and succeeding TEMPS are updated as necessary and prior to program acquisition milestones. The addition of the NFCS Phase I Plus element (that is a minimum missile mission planning subset capability from the NFCS ORD, paragraph B) will be addressed in a revised NFCS ORD and TEMP in sufficient time to yield a NFCS Phase I Plus FOT&E capability in February 2004. Page 18

Comments: (Page 17) The common fire-support operational requirements document is the NFCS ORD. The USS Coronado is a sea-based test bed and has been used for concept exploration and risk reduction activities for C3F activities. PMS529 has actively participated in fleet battle experiments commencing with FBE-B in 1997. Subsequent updates for fire support command and control should be articulated in future NFCS ORD revisions. Page 21

Comments: (Page 19, paragraph 2) The J-6 organization chopped on the (original) NFCS ORD and will be alerted to their certification requirements with the revised version of the NFCS ORD. Page 21

Final Report Reference

Page 22

Comments: (Page 20, paragraph 1) Recommend delete LAWS from last sentence. PMS529 uses LAWS as a prototype for Navy fleet battle experimentation. NFCS is the documented, configuration managed, program of record sponsored by N76.

Page 22

Comments: (Page 20, paragraph 1) It is most likely that NFCS operational tests will be conducted at San Clemente using West Coast ship test assets. Currently, the designated OA ship is USS LASSEN (DDG-82). The OPEVAL ship as currently planned will either be the DDG-82 or DDG-85. The NFCS test community continues to participate in scheduling conferences and works with the PMS400 PSA.PDA manager to obtain ship test assets.

Page 23

Comments: (Page 21, paragraph 4) There is no requirement to conduct a comparative test between manual versus automated NFCS processes. A requirement for this test would be an OPTEVFOR decision to validate NFCS efficiency and would appear in their test plan.

Audit Team Members

The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, prepared this report. Personnel of the Office of the Inspector General, DoD, who contributed to the report are listed below.

Mary L. Ugone
John E. Meling
Jack D. Snider
Susan J. Lippolis
Mark E. Stephens
Frank Downey
Kelly R. Veith
Julie A. Wells
Dan B. Convis
Jacqueline N. Pugh